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Table of Contents.

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ORIGINAL ARTICLES— PAGE.

Defence of the Civilian Population against Gas, by P. R. WELDON, A.I.C., A.A.C.I. 33
The Preparation and Testing of Surgical Catgut, by F. ELEANOR WILLIAMS 39
Chronic Gastritis, by H. C. RUTHERFORD DARLING, M.D., M.S., F.R.C.S. 45
Ante Mortem Clots in the Chambers of the Heart, by J. BURTON CLELAND, M.D. 50

REPORTS OF CASES—

Tube and Ovary in the Inguinal Hernia of an Infant, by E. R. Roseby, M.B., Ch.M. 52
Pink Disease with Fatal Hæmorrhage, by J. STANLEY REED, M.B., B.S. 52

REVIEWS—

History of Tuberculosis 52

LEADING ARTICLES—

Nutrition 53

CURRENT COMMENT—

Pneumothorax Therapy in Pulmonary Tuberculosis 54
The Prediction of the Basal Metabolic Rate 55
Self-Performed Surgical Operations 56
The Diagnosis of Dissecting Aortic Aneurysm .. 57

ABSTRACTS FROM CURRENT MEDICAL LITERATURE— PAGE.

Surgery 58

BRITISH MEDICAL ASSOCIATION NEWS—

Scientific 60
Nominations and Elections 67

CORRESPONDENCE—

The Prince Henry Hospital, Sydney 67
The Histidine Treatment of Peptic Ulcer 67

BOOKS RECEIVED 68

DIARY FOR THE MONTH 68

MEDICAL APPOINTMENTS 68

MEDICAL APPOINTMENTS VACANT, ETC. 68

MEDICAL APPOINTMENTS: IMPORTANT NOTICE 68

EDITORIAL NOTICES 68

DEFENCE OF THE CIVILIAN POPULATION AGAINST GAS.[1]

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FIRST of all I wish to state that nothing I may say this evening is to be taken as an official expression of departmental opinion regarding chemical warfare.

I propose to discuss: (i) some typical gases and their action on the human body; (ii) the means by which they may be distributed; (iii) individual protective devices; and (iv) methods of protecting civilians from aerial attack.

Before dealing with defence against chemical warfare, it is necessary to give some idea of what chemical warfare is. The word "gas" in connexion with warfare is very loosely used. The term includes not only true gases and vapours, but also solids and liquids; in fact, any chemical substance, whether a solid, a liquid or a gas, which is used because it produces poisonous or irritant effects on the human body, is known by the general name of "gas". Such substances are, broadly speaking, dispersed in the air as vapours or poisonous smokes and produce their effects on persons exposed to contaminated air. Some of them, such as mustard gas, in addition to the action of their vapours, act on the human body by direct contact of the substance or of objects contaminated therewith.

The first case in which a gas cloud was encountered in modern war was on April 22, 1915, when chlorine was liberated by the Germans; but as the use of gas developed, more poisonous substances with different properties were used by the various combatants.

[1] Read at a meeting of the Victorian Branch of the British Medical Association on May 6, 1936.

In order to discuss measures of defence it will not be necessary to refer to all the gases used in the last war nor to speculate on those likely to be used in future wars; the description of a few typical examples will be sufficient.

The length of time during which a gassed area remains dangerous determines whether or not it is necessary to adopt elaborate decontamination methods; and gases may be classified as persistent or non-persistent according to whether they evaporate slowly or whether they rapidly form a cloud of gas or smoke which drifts down wind and is soon diluted to a harmless concentration. Gases may also be grouped according to the chief effect they exercise on the human body; typical groups are the lung irritant, nose irritant, lachrymatory and vesicant gases.

Phosgene is a typical lung irritant and attacks the breathing passages and lungs, death frequently being the result. It is a gas at ordinary temperatures and is therefore non-persistent.

Most of the nose irritants, such as diphenylchlorarsine, are used in the form of smokes consisting of minute solid particles. These smoke clouds are dispersed by the wind and are therefore non-persistent. Such substances produce a temporary irritation of the nose and throat, aching of the teeth, headache *et cetera*, these effects being produced by very low concentrations.

In their original liquid form lachrymators or tear gases vary greatly in boiling point and therefore vary correspondingly in persistence. Ethyl iodoacetate is a liquid which evaporates slowly at ordinary temperatures and therefore is classified as a persistent gas. In low concentrations it causes smarting of the eyes and a profuse flow of tears, but these effects soon pass off in pure air. In high concentrations it is also a lung irritant.

Mustard gas is a typical vesicant and is a liquid with a faint smell, described by different people as resembling that of mustard, garlic, horse-radish *et cetera*. Unfortunately the sense of smell quickly becomes fatigued and no longer acts as a warning; moreover, some persons can smell the gas only when it is present in high concentrations. Injuries can be caused by the vapour and by contact with either the liquid or objects contaminated by it. If respirators are not worn the eyes and lungs are attacked, but the effect which is most difficult to combat is the reaction on the skin. Both liquid and vapour cause burns of the skin, and it will be realized that mustard gas on boots or clothing is dangerous, not only to the wearer, but also to those with whom he comes in contact. In this connexion it should not be forgotten that entry of a contaminated person into a warm room may result in the evaporation of sufficient mustard gas from his clothing to render the atmosphere of the room dangerous.

Methods of Using Gas.

Gas may be discharged by means of a large variety of weapons, the chief of these being cylinders, projectors, guns, trench mortars and aircraft.

Early gas attacks were from cylinders which had to be dug in in the front line and were liable to be hit by a chance shell; if this happened, it not only did away with the possibility of surprise, but made things very unpleasant for the troops occupying that line. A later development, when light railways ran up to suitable positions, was to mount a number of cylinders on trucks and arrange them so that gas could be discharged simultaneously from them by closing an electric circuit.

The Livens projector is a simple mortar which is cheap to make and easy to install, and in which the weight of gas is high compared with the total weight of the bomb. If sufficient labour is available, large numbers of these mortars can be dug in, loaded and sighted in one night and can then be fired simultaneously. The result is that high concentrations of gas can be projected within the enemy lines with little warning.

Gas has also been fired in trench mortar bombs and in shells of most calibres. During the War a type of gas attack frequently met with was bombardment with gas shell. The long range of artillery and its ability to concentrate, with little or no warning, the fire of a number of guns on one target render artillery shell one of the most effective means of employing gas. As the gas content of shells is small for their weight compared with other gas containers, gas shells must be used in large numbers.

Gas was not used from aircraft, as far as I am aware, in the last war; but discharge from these machines is practicable and must be anticipated if gas is used in future wars.

Aircraft bombs may contain a high proportion of gas, since they need only be stout enough to be handled and have not to stand the shock of discharge from a gun.

Another method by which "gas" may be discharged from the air consists in spraying a liquid poison, such as mustard gas, from tanks carried by aircraft so that it falls to the ground like rain.

If an unscrupulous nation decided to employ gas against civilians, most of these methods of discharge could not be used except in special circumstances, and aircraft would be the only practicable means of distributing gas.

The type of gas most likely to be used from the air would be a persistent gas with properties similar to those of mustard gas. If sprayed, drops on skin or clothing might pass undetected until casualties were produced. If bombs were dropped, any material splashed by the liquid, for instance, brickwork, concrete, earth, clothing, roadways *et cetera*, would be dangerous to touch, and persons who came in contact with it would be injured unless immediate steps were taken to decontaminate it. Vapour would also be given off from contaminated material and the area immediately down wind

would be dangerous. The extent of this danger would depend largely on the weather conditions at the time.

Defence against Gas.

Protection against gas may be divided into two classes: first, collective protection, which may be effected by the provision of gas-proof shelters, by arranging for adequate warning of impending attack, by providing means of destroying gas and by decontaminating and treating persons who have come in contact with it; and, secondly, individual protection, such as may be provided by respirators and protective clothing.

Respirators may be divided into four classes, but all classes are not necessarily suitable for protection against chemical warfare agents. The classes are: (i) self-contained oxygen breathing apparatus, (ii) hose masks, (iii) respirators of either the full facepiece and container or "snout" types, and (iv) dust respirators. These classes overlap to a certain extent, but in general each has its definite uses and limitations.

During the War, respirators of the facepiece-container type were used very extensively, and instructors held forth about the excellent protection they afforded against all gases which the enemy could possibly use. The result is that there is a fairly widespread belief that such respirators offer full protection no matter what concentration of gas is present and no matter whether there is or is not sufficient oxygen present to support life. How widespread the belief is, is illustrated by the number of requests addressed to the Department of Defence for gas masks to be used against all sorts of industrial hazards. As an instance, one firm wished to use respirators for entering a room in which sulphur had been burned, when a simple calculation showed that there was insufficient oxygen in the total volume of air in the room to burn completely the sulphur which was used.

An endeavour to remove such misunderstanding is my main justification for treating these devices in some detail.

Self-Contained Oxygen-Breathing Apparatus.

Self-contained breathing apparatus enables the wearer to be independent of the surrounding atmosphere for the supply of pure air to his lungs. In this type of apparatus the air is recirculated, carbon dioxide being absorbed and fresh oxygen supplied either from a cylinder or by the action of expired carbon dioxide on some oxygen-producing mixture. Such an apparatus is the "Proto", which is manufactured by the British firm of Siebe Gorman. This apparatus will function for about two hours before the cylinders are exhausted. The "Salvus" apparatus made by the same firm is much lighter than the "Proto", but lasts only for about half an hour. As the wearer is quite independent of the surrounding atmosphere for his air supply, an apparatus of this type gives full protection in the highest concentrations of toxic gas as well as in atmospheres deficient in oxygen. The radius of action is therefore not restricted, as it is with an apparatus obtaining air from an outside source.

After mining explosions, rescue parties are always liable to encounter atmospheres deficient in oxygen or containing high percentages of carbon monoxide. For this reason the self-contained oxygen breathing apparatus is the most suitable type for mine rescue work.

The defects of this type of apparatus are that it is heavy and rather cumbersome, is usually expensive and can be used only by trained personnel. Nevertheless it is the only apparatus which is suitable for mine rescue work and for many other cases in which very high concentrations of poisonous gases are encountered. As it is usually held for use in an emergency, it should be frequently inspected to insure its being in working condition when such an emergency arises.

Hose Masks.

Hose masks consist of some type of facepiece attached to a length of "non-kinking" hose, through which air is drawn by the wearer's breathing from a source which is not contaminated. An outlet valve and an inlet valve are usually provided, and in some cases screens for preventing the entrance of coarse dust particles. The distance from which air can be drawn in this manner is usually not more than thirty or forty feet; if a greater length of tube is used it is necessary to fit the apparatus with a bellows or a blower. An interesting variant of this type of mask is the small face mask provided as part of some spray-painting plants, in which a positive pressure is maintained by the compressor used for working the spray gun. This latter type is sometimes unpleasant to use owing to the difficulty of preventing slight oil contamination in the air supplied by the compressor.

Hose masks should always be firmly attached to a stout belt; otherwise there is danger of the facepiece being dislodged by a pull on the tube. If properly fitted, masks of this type are useful in atmospheres deficient in oxygen or containing high concentrations of toxic gases. For instance, they may be used in repairs to gas mains and work in oil tank wagons and in pits and wells where carbon dioxide has accumulated. Their usefulness is limited, however, by the fact that the wearer is "anchored" by the hose to his source of fresh air. Particular care has to be taken when using such masks to see that this source actually is pure and that there is no kinking or interference with the hose. In one case which has come to my notice men fitted with hose masks were working near a blast furnace and, owing to the "source" end of the tube being wrongly placed, a fairly high concentration of carbon dioxide was drawn in. In another case, when the wearers were inside an armoured car, a change of position of the turret allowed gases from the machine gun to enter the masks.

Respirators.

Respirators depend on filtration from the air of toxic gases, vapours and dusts, and may be divided

into the "snout" type and the facepiece-container type.

The "snout" type of mask gives no protection to the eyes and is very difficult to render gas-tight. When testing a "snout" mask it is sometimes possible to substitute a tight-fitting cork for the filter, fit the apparatus to the face with the utmost care, and then breathe with very little additional difficulty. The small area of filter which can be incorporated into a design of this type makes it very difficult to stop fine dusts and smokes without increasing the resistance unduly, while the small volume of charcoal which is contained in cartridges supplied with some of these masks gives little protection against toxic gases.

Respirators of the facepiece-container type were devised during the War, and a representative of the type, the small box respirator, was still in use when the War ended. The facepiece of this respirator was made from a rubberized fabric and the fitting edge was of velvet. As the nose was closed with a clip and a mouthpiece was fitted into the mouth, the body of the facepiece protected the wearer chiefly against substances which injure the skin and eyes. The container was filled with active charcoal and granules containing soda lime and an oxidizing agent. In the later stages of the War a pad consisting of a number of layers of cellulose paper was added to act as a filter to remove toxic smokes.

In more modern facepieces the nose clip and mouthpiece are usually omitted and reliance is placed on the fit around the edge of the face, while the incoming air is led over the eyepieces in order to assist in preventing them from dimming. As regards comfort and vision such masks are a great improvement on anything produced during the War. A service mask of this type has to have a very long life, otherwise replacement costs become prohibitive; and the rubber has to be exceedingly soft so as to conform to the contours of the face.

Before leaving military respirators, it may be interesting to refer to the German respirator used during the greater part of the War. The facepiece was originally made from rubberized fabric held in position by means of an elastic webbing harness. Later, when rubber became scarce in Germany, coiled springs were substituted for the elastic webbing and heavily oiled leather for the rubberized fabric. The drum contained hexamine and potassium carbonate on fragments of brick, and a layer of very highly absorbent charcoal. As this drum was suspended direct from the facepiece, no connecting tube was necessary. Respirators of this type are fairly common in Europe, but possess the defect that drums which can be thus hung from the chin must be kept reasonably small; otherwise it is difficult to prevent the facepiece from moving on the face. This limits the protection which can be given.

When considering the use of respirators in industry, it must be remembered that the protection required is generally of a different type to that which is desirable in a service respirator.

A service respirator must be capable of defending the wearer against any toxic material which it is practicable to use in war. A concentration of 1% of a gas is very exceptional in the field and for some of the toxic smokes one part in a million is a high concentration. It will therefore be seen that the army respirator has to afford protection against a large variety of substances, usually in low concentrations.

The industrial respirator is largely used in an emergency and in most plants against only one gas, or, at any rate, one type of gas. Concentrations may, however, be very high, amounting in some cases to 3% or 4%. The material of the filter can therefore be that best suited to the gas which is handled in the plant. On account of the high concentrations met with, the gas-tightness should, if anything, be greater than that of the service respirator.

To sum up, respirators of the facepiece-container type are devices to remove toxic materials from atmospheres which are otherwise respirable. They should therefore not be used in atmospheres in which shortage of oxygen is suspected or in which concentrations of toxic materials are likely to be very high.

Masks for Protection against Smokes and Dusts.

Particulate clouds or smokes are not absorbed by chemically active granules or activated charcoal and must be removed by mechanical filtration. They vary enormously in particle size and consequently a filter effective for coarse particles may be entirely valueless for a cloud composed of finer particles. Thus half an inch of cotton wool will stop a cloud of stannic chloride, but a sulphur trioxide cloud will pass through it; the latter will in its turn be stopped by a filter composed of cellulose wadding. If, however, it is desired to filter diphenylchlorarsine (a toxic smoke which is irritant in very low concentrations) the filter would have to contain many more layers of cellulose wadding than would suffice to stop sulphur trioxide. Therefore, if one is endeavouring to filter the finer smokes, a very large filtering surface is necessary if resistance is not to be increased unduly.

Protection of Civilians.

An account has been given of typical substances used in chemical warfare, of means used in projecting them, and of apparatus which may be used by trained personnel for protection against them. It is now proposed to discuss the means which can be taken to protect the civil population, a large part of which it will not be possible to train.

The defence of civilians is a problem which differs greatly from that of protecting soldiers. Soldiers are carefully trained in the use of respirators, are accustomed to obey orders without question, and are physically fit. Many civilians can be as easily trained as can soldiers, but it is also necessary to cater for sick or elderly people and children; collective protection is here preferable to the use of respirators.

So far my remarks have been confined to protection against gas, but if civilians have to be protected against aerial attacks, the use of high explosive and incendiary bombs must be considered, and the need for protection against these bombs will greatly influence methods of defence against gas.

Firstly, arrangements will have to be made, as in the last war, for the public to receive the earliest possible warning so that they may get under cover. An air raid when the streets are crowded with people would be a very serious matter.

The construction of large numbers of shelters which will be proof against direct hits by bombs is impracticable. Such shelters would have to be constructed of concrete of great thickness or corresponding material of equivalent strength, and, apart from other considerations, the cost would be prohibitive. On the other hand, effective protection against blast and splinters can be obtained at comparatively small cost, and it is comparatively easy to make a room gas-proof. The point is that these precautions will have to be taken by the occupiers of premises on behalf of their households or workers and customers.

It will be necessary to make a room gas-tight and splinter-proof in each home, office *et cetera*, and in addition to provide communal shelters scattered about the city for people who are at a distance from their homes and places of business. In general, people who are in suitable buildings when the warning sounds should stay there; all others will have to proceed to the nearest shelter. People must get under cover as quickly as possible, and then there should be no unnecessary movement until the raid is over.

The choice of such a room must be a compromise. The best protection from high explosive bombs is obtained below ground level—the top floor is the most dangerous when incendiary bombs are concerned; and a room on any floor above the ground floor is safer from gas than the ground floor.

The official handbook lays down that:

1. A cellar or basement is best.
2. If there is no basement, choose a first floor room if there is another floor above it; but in a two-story house choose a room on the ground floor.
3. The windows of the room should be small and, if possible, not in exposed positions. (If they face soft ground the blast of an explodinqg bomb will be more smothered than if they face a paved or metalled surface.)
4. If possible, the room should be on the side of the house least exposed to prevailing wind.
5. All doors and windows in the house should be shut before retiring to the protected room.
6. Gas protection should be applied as fully as possible to the whole house. (This will render the selected room safer and the house will require less airing to render it safe when the attack is over.)

As regards protection of the selected room, special attention should be paid to the windows. The glass is liable to be broken, and it is desirable to paste strong paper to the glass to lessen the chances of its collapsing. If possible, windows should be boarded up on the outside to protect the glass from the blast of high explosives. In addition, the inside should be covered with oilcloth, carpet, blanket, linoleum or similar materials.

The door should be covered on the outside with a blanket or similar material fastened by strips of wood to the top and one side of the door frame. The blanket can then be raised from a bottom corner to allow the door to be opened. If there is a large crevice at the bottom of the door, a thin strip of wood should be nailed to the floor to form a small step against which the door will fit tightly. Fireplaces will need to be blocked with wood, cardboard, blankets or similar materials, and all crevices, especially around doors and windows, should be blocked with a mush of paper and water or by pasting paper over the cracks. Keyholes should not be forgotten.

Such rooms will have to be furnished to allow their occupants to remain inside for some hours. Smoking cannot be permitted; but food, blankets for warmth, candles and matches or electric torches and books and other means of keeping the occupants engaged in a sedentary fashion should not be forgotten. Great care should be taken that any persons who have been exposed to mustard or other persistent gases should remove outer clothing and boots before entering such a protected room, so that they will not endanger the occupants by carrying contamination inside.

Provision must be made for lighting restrictions. Enforcement of lighting regulations should be the responsibility of the police, and municipalities should arrange for reducing or extinguishing street lighting.

It will be necessary to work out some system of reporting promptly the fall of bombs and the nature of the damage caused, including the presence of gas. Mapping out the location, degree and nature of the contamination will require a knowledge of chemistry or specialized training.

The police force must be supplemented by special constables. Those on duty during air raids must be provided with masks and protective clothing, and in addition the fire-fighting organization will have to be strengthened and its members provided with respirators and special clothing. It should be remembered, as J. B. S. Haldane pointed out some years ago, that raids on London were never severe enough to cause more fires than the brigades could handle. It is not nice to think of what might happen if this should occur. In order to relieve police and fire brigades as much as possible, squads of men should be organized, equipped and trained for working in damaged buildings which are not on fire, to rescue persons who are injured or trapped, and to shore up dangerous walls *et cetera*.

Medical and first aid resources must be organized to handle casualties due to both wounds and gassing. This will probably involve first aid parties working in conjunction with ambulances, combined first aid and decontamination centres, provision of

decontamination arrangements at hospitals, and the establishment of base hospitals outside the area of intensive bombing, to which can be evacuated casualties requiring prolonged hospital treatment.

Persons whose clothing is contaminated with liquid mustard gas or lewisite will require to have their clothing removed, to have a hot bath and to be provided with fresh clothing as quickly as possible. This will mean that first aid and decontamination will have to be easily available to everyone. First aid parties will decide which people require immediate surgical attention and will dispatch them by ambulance direct to hospital, where decontamination will also be carried out if it is necessary. To sum up, the decontamination centres will be expected to deal with minor injuries caused by bombs *et cetera*, casualties due to non-persistent gases, cases of either type in which there is also contamination with mustard gas, and persons contaminated by mustard gas who are not yet casualties. In mapping out such a centre it is essential to keep contaminated and uncontaminated persons apart and to arrange that persons after decontamination will not have to retrace their steps through rooms where they will perhaps again be contaminated.

It will be necessary to provide protective clothing for those on duty during and after a raid. Such clothing consists mostly of articles of oilskin, only underclothing being worn underneath. To protect against mustard, both as liquid and vapour, protective clothing must be practically air-tight, and in consequence heat and perspiration are retained inside the clothing. The result is that, owing to fatigue, only a limited amount of manual work can be performed by the wearer of such a suit, and the hotter the weather, the less will be the amount of work he can accomplish.

As has been previously stated, respirators and some protective clothing must be provided for police and firemen, also for Red Cross and other rescue personnel and for those carrying out decontamination work. The completeness of such clothing will vary with the danger of the work.

Decontamination of vehicles, buildings and their contents and contaminated ground will have to be carried out by specially trained and highly disciplined persons who are capable of working at high speed under exceedingly trying conditions. In fact, all civilians who require to move freely during a raid, whether they be medical or first aid personnel, police, firemen or decontamination squads, will need a training analogous to the anti-gas training of the soldier.

Non-blistering gases, such as phosgene, chlorine and the arsenical gases, will not require any decontamination measures, as they will be quickly dispersed by the wind, upward air currents *et cetera*. Persistent gases of the non-blistering type, such as the liquid tear gases, can be treated by hosing with water if there is adequate drainage; otherwise, it is best to minimize their effects by covering them with a thick layer of earth.

A detailed account of methods of decontamination from the blistering gases is not practicable here, and it will be possible to refer only briefly to the procedure.

Substances commonly used in decontamination are water, earth, bleaching powder and sodium hypochlorite solution.

Water hydrolyses mustard gas very slowly if cold and more rapidly if hot. It can therefore be used to wash mustard gas from a surface and to carry it away so that it can be slowly destroyed by the water. Water that has thus been used for washing remains dangerous for some time and should not be allowed to come in contact with the skin.

Earth merely covers contamination and prevents evaporation to a large extent. Spots covered with earth may be dangerous for many days if the earth is disturbed, and precautions should be taken to see that they are not interfered with and that warning notices are erected.

Bleaching powder and sodium hypochlorite solution both destroy mustard gas very quickly, but the former should be used mixed with two or three times its volume of earth or as a paste, the action between undiluted bleaching powder and mustard being too violent.

Roads can be treated by filling up bomb holes with fresh earth and covering splashes of liquid mustard with two or three inches of dry earth. Extensive hosing down will also probably be resorted to.

Walls may be treated with a paste of bleaching powder. Wood, if very seriously contaminated, is usually best destroyed by burning; otherwise it may be scrubbed with a paste of bleaching powder and then hosed.

These remarks only touch on the problem of decontamination, but they will serve to indicate how the problem can be tackled.

During and after raids it will be necessary to see that essential services, such as those of water, gas and electricity, are kept going, at any rate on a basis of minimum requirements, and the civic authorities should arrange to coordinate work of repair with their own repairs on roads. Repair of roads is of the utmost importance, as all the above activities will depend on the maintenance of an adequate system of roads in a useable condition.

In conclusion it may be stated that references to the possibility of "wiping out cities", which occasionally appear in the Press, are grossly exaggerated. Perhaps the greatest menace to be feared if gas is used against cities is that ignorance and dread of the unknown may cause panic if the general public is dependent on alarmist statements as to the dangers involved and is ignorant of precautions which will provide a reasonable degree of protection.

Acknowledgement.

I desire to acknowledge indebtedness to the President of the Chemical Defence Board for permission to publish this paper.

THE PREPARATION AND TESTING OF SURGICAL CATGUT.

By F. ELEANOR WILLIAMS,
From the Walter and Eliza Hall Institute, Melbourne.

DURING the last three years there have come to my knowledge eight cases of post-operative tetanus which have occurred in various hospitals in Melbourne and in which suspicion has been directed to catgut as the likely source of infection; but in two of these cases only have organisms, morphologically resembling *Clostridium tetani* and causing the symptoms of tetanus in guinea-pigs, been recovered from the suspected suture material. In two cases of post-operative gas gangrene infection occurring during the same period the catgut used at operation has come under suspicion.

The demonstration that sporing organisms can be grown from a given sample of catgut does not justify the belief that the use of such material will inevitably be followed by dangerous infection. Most of the organisms that I have isolated from infected catgut have been non-pathogenic, and, as is well known, the spores of *Clostridium tetani* may be implanted without tetanus occurring unless toxin is also present or conditions are suitable for its production.

Professor Bulloch's recent reference[1] to post-operative tetanus as a "bogy" did not meet with universal acceptance, though it is apparent that this bogy may be laid if sufficiently rigid technique is applied to the preparation of catgut by the iodine method and to its storage.

In the investigation of the sterility of catgut prepared for surgical use it is essential at the outset to control the sterility of the apparatus and reagents used in its preparation, storage and testing. This has been recently emphasized by Dalrymple-Champneys.[2] Alcohol in various strengths is so used, and my experiments in confirmation of those of Mackie[3] have shown that sporing organisms remain viable even after long periods in this reagent.

The Sterility of Commercial Alcohol, of Redistilled Alcohol and of Methylated Spirit.

Sixteen samples of methylated spirit, six samples of absolute alcohol, and many samples of freshly distilled alcohol were tested. Samples of twenty cubic centimetres were taken with a sterile pipette from the bottom of vessels containing them. These were centrifuged and the deposit was cultured.

Twelve of the cultured samples of methylated spirit grew sporing organisms, some of which were anaerobes yielding a foul stench on culture. Of the six samples of absolute alcohol cultured, two grew sporing organisms. All the cultures from freshly distilled alcohol were sterile.

Alcohol could be readily sterilized by filtration, as the following experiment shows.

One hundred cubic centimetres of alcohol were infected with cultures of *Bacillus mesentericus* and *Clostridium welchii* and subsequently filtered through a Seitz filter. Of the filtrate, 50 cubic centimetres were centrifuged and what little deposit there was was cultured. The centrifuged alcohol and the alcohol remaining in the filter flask were evaporated and the residue from each was cultured. No microorganisms were grown either from the centrifuged deposit or from the residue from the filtrate. Sporing organisms could be cultured from the unfiltered infected alcohol even after several weeks.

To insure its sterility alcohol must be freshly distilled and collected in sterile vessels or filtered through suitable filters. Special stress has been laid upon the necessity for the sterility of alcohol, since this is used both in the preparation and storage of surgical catgut and it is so generally assumed that alcoholic solutions are necessarily sterile.

The watery iodine solution (1% iodine, 2% potassium iodide, 0·25% potassium iodate and 5% glycerol) will within nine days kill all sporing organisms, even if these are within the substance of gut undergoing sterilization. Mackie[3] found that this watery iodine solution (without the iodate or glycerol) killed *Bacillus mesentericus* within six days and other sporing organisms, including *Clostridium tetani, Clostridium sporogenes, Clostridium welchii* and *Clostridium septique,* within twenty-four hours. None of the other solutions used in preparation or storage, unless they contain traces of iodine, have any bactericidal action. I have shown that 85% alcohol containing 0·1% iodine will kill sporing organisms within thirty days.

Frequently in the preparation of catgut the solutions are prepared from non-sterile alcohol, put into non-sterile Winchester bottles, which are fitted with ordinary corks or glass stoppers (generally corks). The lips of the bottles provide a good catchment area for dust, over which the solutions are poured when used. Solutions prepared in this way and used for removing the iodine, which has sterilized the ligatures, provide every opportunity for contamination.

Precautions Necessary in the Preparation of Catgut.

The following precautions are necessary in the preparation of sterile catgut by the iodine method. When raw catgut ligatures are removed from the packet, they should be placed on a sterile towel and the length of each should be measured to ascertain the amount of iodine sterilizing solution required. As there is much variation in the grading of ligatures in each packet, it is as well to retest them on a wire gauge, to insure that only ligatures of the same size are wound on each reel, which should be of large bore. It is not advisable to wind more than three ligatures (10 to 15 feet in length) on one reel. Reels of non-absorbent material are preferable. Wooden reels reduce the effective concentration of iodine by absorption.

The ligatures should be wound in their natural coil. Whether they should be loosely or tightly wound is a matter of opinion. All brands, loosely

wound, swell one size in watery iodine solutions, the shrinkage due to this swelling varying from three to seven inches in ten feet. When they are tightly wound there is less swelling, but the ligatures tend to become flattened.

The ligatures are now put into sterile glass jars, fitted with lids covering at least two inches of the outside of the jar. Large jars should be used, because, according to Bulloch, Lampitt and Bushill,[4] to insure complete saturation and sterilization, 12·5 cubic centimetres of iodine sterilizing solution are required for every five feet of ligature.

The ligatures should be left in iodine solution for not less than nine days. With sterile forceps they are then transferred to sterile jars containing 70% sterile alcohol.

The ligatures are left in 70% alcohol (25 cubic centimetres for every ten feet of catgut) for twenty-four hours and are then transferred for a second period of twenty-four hours to a similar quantity of sterile 70% alcohol. They are next placed in 85% alcohol, where they remain for another twenty-four hours, and are finally stored in an 85% solution of alcohol containing 0·1% iodine or in 96% alcohol.

When the sterile reels of ligatures are to be used in the theatres, they should, to save handling and exposure to the air, be threaded on glass rods and placed in a sterile dish covered with a lid containing holes through which the ligatures can be drawn and cut off as required.

All the glass apparatus used in this process should be sterilized by autoclaving (30 minutes at 120° C. and fifteen pounds pressure per square inch). Distilled water and glycerol are also sterilized by autoclaving. Alcohol is sterilized by filtration (Seitz special filters being used) into sterile Winchester bottles, which can be subsequently fitted with tubes to allow removal of the fluid by siphonage.

Sterilization of Alcohol by Filtration.

For those not accustomed to laboratory procedures the following details of sterilization of alcohol by filtration are given.

The special filter pad is fitted into a Seitz filter, which is loosely screwed down and covered with paper. To the exit tube of the filter are attached five inches of rubber pressure tubing. This is connected to a glass or metal tube leading through a rubber cork which fits tightly into the neck of a Winchester bottle. Through the cork a second tube passes to connect the bottle to the filter pump. We use a special metal fitting which requires only one hole in the cork and which provides for entry of fluid to the bottle from the filter, removal of air by the pump or displacement of liquid from the bottle by pressure instead of suction. The whole apparatus is sterilized by autoclaving.

After the autoclaving the screws are tightened and the filter is connected to a water pump. During filtration the filter must never be allowed to empty nor the pad to become dry.

A siphon for withdrawing the filtered alcohol is made in this manner. A Winchester bottle, before being used for filtering alcohol, is fitted with a rubber two-hole cork, through which are inserted two lengths of glass tubing, one short and one the length of the bottle. The two projecting ends are bent at an angle and the short end is plugged with cotton wool. To the longer length, which is the outlet, are attached about eight inches of stout rubber tubing provided with a spring clip.

Into the free end of the rubber tubing is fitted a glass pipette, put through a rubber cork which fits into a glass cylinder four inches long. The end of the pipette is covered with a small glass tube, the outside of which is covered with cotton wool and fitted tightly into the cylinder. The siphon is wrapped in several layers of paper and sterilized under pressure for half an hour.

As soon as the alcohol is filtered the lip of the bottle is flamed and the filter is quickly replaced by the sterile siphon, the rubber cork of which must fit tightly into the neck of the bottle.

To withdraw alcohol a rubber ball pressure pump is attached to the short length (or inlet) of glass tubing. The tube covering the pipette is removed and placed in a sterile test tube. As soon as the spring clip attached to the rubber tubing is released and the bulb is pressed the alcohol will flow. The flow can be regulated by the clip.

When the required amount of alcohol has been drawn off, the sterile tube is replaced over the pipette and the pressure is released by removing the pump. A short length of pressure tubing should be attached to the inlet glass tubing and closed with a screw clip. This prevents unnecessary evaporation of the alcohol.

For making up alcohol of various strengths necessary, a Winchester bottle is marked in litres with a diamond. If two litres of 70% strength are to be made, 600 cubic centimetres of distilled water are put into the marked bottle, which is then plugged with cotton wool and autoclaved. As soon as it is cool, the lip is flamed and the sterile alcohol is run in until the two-litre mark is reached.

The glass cylinder which surrounds the glass pipette fits over the mouth of the bottle and prevents air contamination by microorganisms while the alcohol is running in. So soon as the cylinder is removed, a sterile siphon is quickly fitted into the bottle.

The same procedure is followed for making 85% and 96% alcohol. If glycerol is used, it is added to the distilled water before it is autoclaved.

When 85% alcohol solutions are to contain 0·1% of iodine, the required amount of a sterile 1% iodine solution (100 cubic centimetres per litre) can be added with a sterile pipette to the sterile distilled water before the alcohol is run in. Allowance has, of course, been made for the water content of the iodine solution.

Every bottle of sterile solution must be fitted with a sterile siphon, which must not be removed until the bottle is empty.

The Storage of Sterilized Catgut.

The following experiments were made upon the bactericidal action of various solutions used for the storage of catgut.

Experiment 1.—Storing spirit containing 70% alcohol, 2% glycerol and 0·4% mercury biniodide was taken. Twenty cubic centimetres of this mixture were inoculated with *Bacillus mesentericus* and *Clostridium welchii*. A small amount of this solution was centrifuged each day and the deposit was cultured. After three weeks both organisms could still be cultured from the test deposit.

Of the same storing spirit 20 cubic centimetres were inoculated with *Staphylococcus aureus*. Cultures were made daily from centrifuged deposits. No growth appeared in cultures made after the third day.

Experiment 2.—Twenty cubic centimetres of an 85% solution of alcohol were inoculated with *Staphylococcus aureus*. Cultures were made daily from centrifuged deposit. No growth appeared after the second day.

Experiment 3.—Twenty cubic centimetres of an 85% solution of alcohol containing 0·1% iodine were inoculated with *Bacillus coli*, streptococci and staphylococci, and cultures were made each day from centrifuged deposit. No growth appeared after the first day.

Twenty cubic centimetres of this solution were inoculated with *Bacillus mesentericus*. After three weeks this organism could still be recovered by culture, but after four weeks no organisms could be grown.

It is obvious that alcohol has no bactericidal effect on sporing organisms. Biniodide of mercury, 0·4%, is also without effect on sporing organisms. It is usually added to storing spirit without care being taken to insure its sterility and is a possible source of contamination.

It may be urged against the use of iodine in the storing spirit that this is likely to alter the physical properties of the catgut. While this may be true of higher percentages, the low concentration here advocated does not impair the tensile strength of the gut.

It is of interest to note in passing that large quantities of commercial spirit are daily used in operating theatres, where it is regarded as being sterile. To what extent post-operative infections may follow the free use of this definitely non-sterile fluid it is impossible to state. Many of the organisms present in it are non-pathogenic and many single organisms doubtless gain entry to the operation wound, but are dealt with by the cellular and humeral defences of the patient. Spirit which is to be used in operating theatres should unquestionably be sterilized by distillation into sterile receptacles or by filtration.

Recognition of the fact that spirit is not bactericidal against sporing organisms but may be made so by the presence of a very low percentage of iodine should lead to the use of spirit so treated for the storage of ligatures. The following results of the examination of the stock fluids used for storage of catgut in a hospital operating theatre further emphasize this important point.

From the stock 70% alcohol *Bacillus subtilis* was grown; from the stock 70% alcohol with 2% glycerol anaerobes were grown which produced stinking gas on culture (*Clostridium sporogenes* and *Clostridium welchii*), together with *Bacillus subtilis*; and from the stock of 95% alcohol containing 0·4% mercury biniodide *Clostridium welchii* was grown.

In this theatre the technique for handling such supposedly sterile fluids was also at fault, for sporing organisms were grown from the dust on the lips of the large bottles containing these storing reagents.

Testing the Steriltiy of Catgut.

For the purpose of testing the sterility of catgut the following reagents are required, all of which must be sterilized: (i) absolute alcohol sterilized by filtration and its sterility controlled by evaporation of samples, the residues being taken up in water and tested by aerobic and anaerobic culture in suitable media; (ii) distilled water, tubed and autoclaved; (iii) commercial ammonium sulphide, sterilized by filtration; (iv) 1% sodium thiosulphate and 1% sodium carbonate tubed and autoclaved.

Recently we procured in the open market samples of plain catgut manufactured by ten different firms (English, American, German and Australian), and used the methods recommended by Bulloch[4] for testing its sterility. One hundred and twenty-six tubes were examined. Each contained five feet of catgut and was labelled "sterile". The following method was used for opening all sealed tubes. The upper half of each tube was wet with sterile alcohol and flamed, and a line was filed around each tube about half an inch from one end. It was again wet with sterile alcohol and flamed and a red-hot rod was placed on the filed line. The tube was held vertically and the upper portion was lifted off.

The catgut was then removed with sterile platinum wire or forceps (which were immersed in alcohol and flamed between each transfer) and was placed for twenty-four hours in sterile test tubes containing 25 cubic centimetres of sterile alcohol (70%). It was then transferred to sterile distilled water and incubated for twenty-four hours.

When mercury salts had been used in the preparation, these were removed by placing the gut in ammonium sulphide at room temperature for twenty-four hours. Excess of reagent was removed by incubation in distilled water for a further twenty-four hours at 37° C. before the catgut was cultured.

If chlorine, bromine or iodine was used for sterilization, the gut was transferred instead into a mixture of 1% sodium thiosulphate and 1% sodium carbonate and incubated for twenty-four hours before being cultured.

The culture media used were anaerobic meat medium and sloppy agar. The catgut was incubated aerobically for three weeks. At the end of this period all cultures not showing growth were incubated anaerobically for a further three weeks.

Of 126 tubes, 44 were infected with sporing organisms. These results, which are in accord with Clock's[5] extensive studies, are shown in Table I.

Discarding the samples of the less reliable makes (as judged by these tests), D, E, H and I, 63 tubes remain, of which three, or approximately 5%, were infected. Some of the catgut obtained from British

firms was put on the market before the Therapeutic Substances Regulations (1931) became effective. Of tubes issued under this more rigid system of testing there were 25, all of which were found to be sterile.

TABLE I.

Sterility Tests on Plain Catgut in Sealed Tubes. Put up by Ten Different Firms.

Maker	Number of Tubes Examined.	Sterile.	Contaminated.
A	19	18	1
B	7	7	0
C	19	18	1
D	6	2	4
E	12	5	7
F	6	6	0
G	6	6	0
H	39	14	25
I	6	1	5
J	6	5	1

I also tested for sterility 76 tubes of chromicized catgut manufactured by six firms (English, German, American and Australian). The procedure was the same as for plain catgut. The results are set out in Table II. Of the 76 tubes examined, 30 grew sporing organisms.

TABLE II.

Sterility Test on Chromic Catgut in Sealed Tubes. Put up by Six Different Firms.

Maker.	Number of Tubes Examined.	Sterile.	Contaminated with Sporing Organisms.
A	18	8	10
B	8	5	3
H	6	1	5
J	24	18	6
K	12	12	0
L	8	2	6

It will be observed that it is more difficult to insure the sterility of chromicized catgut and that of the samples tested only those of one firm appeared to be reliable. Even catgut issued by British manufacturers under the Therapeutic Substances Regulations were not in every case satisfactory. Of six tubes issued by one firm all were sterile, and of eight tubes issued by another three were non-sterile.

So far as British catgut is concerned, no tubed catgut should be used unless it is prepared in accordance with the requirements of the Therapeutic Substances Regulations of 1931 (Great Britain).

Sterilization of Plain Raw Catgut by the Iodine Method.

The efficiency of the iodine method for the sterilization of raw catgut and the effect of test culture of the whole of the material before issue for use upon the tensile strength of the final product was determined in the following experiment.

We procured in the open market, eight packets of plain catgut, representing eight different brands (English, American, German and Australian). These packets contained ten ligatures, ten to fifteen feet in length, five of which were sterilized by iodine solution containing glycerol (Method 1) and five by iodine solution containing no glycerol (Method 2). Each ligature was loosely wound onto glass spools and immersed in iodine solution for eight days.

The ligatures sterilized by Method 1 were twice washed in a 70% alcohol and 2% glycerol solution, after which one ligature of each brand was put into storing spirit (70% alcohol, 2% glycerol and 0·4% biniodide of mercury), to be used as controls when testing tensile strength and gauge.

The strands sterilized by Method 2 were twice washed in 85% alcohol, and again one spool taken from each brand was put aside in storing spirit (0·1% iodine in 85% alcohol).

The remaining ligatures, sterilized by both methods, were transferred to sterile test tubes containing 25 cubic centimetres of distilled water and incubated for twenty-four hours. They were then transferred to test tubes containing 1% sodium thiosulphate and 1% sodium carbonate and incubated for a further twenty-four hours.

The ligatures were separately cultured and incubated aerobically and anaerobically for three weeks.

Of the sixty-four ligatures cultured, one grew a sporing anaerobe. All the sterile strands were given two washings in sterile distilled water to remove the medium and put through the alcoholic solutions and storing spirit corresponding to the method used.

The gauge and tensile strength was then tested, the ligatures which had not been cultured being used as controls. All the determinations were made on knotted ligatures. The results are set out in Table III.

It will be noted that the presence or absence of glycerol makes no appreciable difference to the ten-

TABLE III.

Tests of Tensile Strength of Catgut Prepared by Iodine Method With and Without Glycerol.

Brands of Catgut.	Iodine Methed With Glycerol.					Iodine Method Without Glycerol.			
	Size.	Size After Preparation.	Tensile Strength After Preparation.	Size After Culture.	Tensile Strength After Culture.	Size After Preparation.	Tensile Strength After Preparation.	Size After Culture.	Tensile Strength After Culture.
	No.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
1	00	00	3	00	3½				
2	0	0	5½	0	4½	0	4½	0	4½
3	0	0	3	1	4½	0	3½	1	4½
4	1	2	7	2	6½	2		2	6½
5	2	2	7	2	6½	2	8½	2	7
6	3	3	9	3	9	3	9	3	10
7	3	3	7	4	9½	4	11½	4	9
8	5	6	12	6	12	6	12	6	12

sile strength of the final preparation, and that subjection of the material to the various processes involved in culture is also without any significant effect.

That repeated culture and resterilization do not seriously affect the tensile strength of catgut is shown even more strikingly by the following observations.

Early last year we were asked to sterilize by the iodine method several different sizes of plain catgut manufactured by an Australian firm. Solutions containing glycerol were used. Three 15-feet ligatures, of sizes Number 0, 1 and 2, were loosely wound onto large glass reels and one of each size onto small glass reels, the latter to be used for sterility, gauge and tensile strength tests.

After immersion for eight days in iodine sterilizing solution the ligatures were twice washed in 70% alcohol containing 2% glycerol. The small reels were then removed and prepared for culture, the large reels being transferred to sterile jars and stored in a solution containing 70% alcohol, 2% glycerol and 0·4% biniodide of mercury.

Surgeons who used this material in one of the theatres were asked to give an opinion of its quality. They considered it excellent in flexibility, tensile strength and evenness of texture.

All the unused ligatures were returned and remained unopened in the storing spirit for a further two months. Although all the single control 15-feet ligatures had been found to be sterile, we decided to culture the large reels that were returned.

There were ten reels of different sizes: four of Number 0, five of Number 1, and one of Number 2.

The iodine in the ligatures was rendered inert with 1% sodium thiosulphate and 1% sodium carbonate before they were individually cultured. Of the ten reels cultured, five grew sporing organisms.

Since the solutions used for storing this catgut were prepared without any of the precautions since found to be necessary, this result is not very surprising.

The five infected reels of ligatures were washed in sterile water and immersed for twelve days in iodine sterilizing solution containing glycerol and cultured. No microorganisms were grown from any of the cultured reels.

Two reels of ligatures, one of size 0 and one of size 1, were given a third sterilization and again cultured, to see if this further treatment had any effect on their physical properties.

The ligatures were unimpaired after three sterilizations in watery iodine solutions, and three culturings had no deteriorating effect. The elasticity, gauge and tensile strength of the catgut were practically unaltered, as will be seen in Table IV.

It seemed important to ascertain the effect of repeated sterilization and culture upon the absorbability of these ligatures.

Plain catgut ligatures sterilized but not cultured, and ligatures sterilized and cultured once, twice and three times, after being stored for one month in 96% alcohol were embedded in the abdominal muscles of guinea-pigs. Each sample was placed in two guinea-pigs.

The guinea-pigs in which the ligatures had been twice and three times sterilized were killed after thirty days and the remainder after thirty-seven days.

On examination the ligatures were found to be surrounded with young fibrous tissue which was becoming organized. There was some softening and swelling of the ligatures, but nearly all the knots were intact.

Figure I shows that in sizes 2 and 1 ligatures once sterilized but not cultured resisted digestion *in vivo* for thirty-seven days. Size 0 was completely digested in one of two guinea-pigs.

Ligatures after a single sterilization and culture also resisted absorption for thirty-seven days (Figure II). Exposure for six weeks at 37° C. in culture media had caused no change in the absorbability of the ligatures.

Ligatures sizes 1 and 2, twice and three times sterilized and cultured, after exposure at 37° C. for twelve and eighteen weeks respectively were not absorbed in guinea-pigs after thirty days (Figures III and IV). Culturing suture material

TABLE IV.

The Effect of Repeated Sterilization and Culture upon Catgut Ligatures.

Size of Ligature (Dry).	Number of Standard Wire Gauge. (Ligature Dry).	Number of Ligatures Tested.	Ligatures Sterilized Once, not Cultured.		Ligatures Sterilized Once, Cultured Once.		Ligatures Sterilized Twice, Cultured Twice.		Ligatures Sterilized Three Times. Cultured Three Times.	
			Gauge.	Tensile Strength.	Gauge.	Tensile Strength.	Gauge.	Tensile Strength.	Gauge.	Tensile Strength.
No.				Lbs.		Lbs.		Lbs.		Lbs.
0	26	10	25	5½	25	5	25	5½	24	6
	26		25	5	25	5½	25	5½		
	25		25	4½	25	4½				
1	25	10	24	6½	24	7	23	7	23	7½
	25		23	7	24	7	23	9		
	24		23	7	24	6½				
2	24	5	23	9	23	9	22	8½		
	24		22	10	22	10				
3	23	2	22	9½	22	9½				
Iodine sterilization without glycerol.										
1	25	1			24	7				
2	24	1			23	7				
3	23	1			22	9				

in bulk has not therefore any obvious effect upon its absorbability.

Some further observations were made on plain and chromicized Australian catgut which was sterilized in the laboratory by the iodine method. For

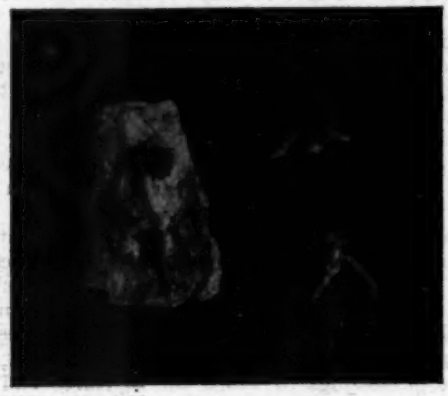

FIGURE I.

On the left a portion of the abdominal wall of a guinea-pig containing, from above downwards, ligatures sizes 2, 1 and 0 (sterilized, not cultured); on the right, from above downwards, two dissected ligatures, sizes 2 and 1 (also sterilized but not cultured) from another guinea-pig. The ligature size 0 had been completely digested after thirty-seven days.

comparison, a good brand of imported catgut was sterilized and tested at the same time. The Australian-made plain catgut was found to be excellent. It was evenly graded, did not swell unevenly in watery solution of iodine, and its tensile strength after sterilization was unimpaired.

FIGURE II.

Ligatures sterilized and once cultured dissected from the abdominal wall of a guinea-pig after thirty-seven days. From left to right, sizes 2, 1 and 0. Size 0 shows softening and some digestion. The knots are intact in sizes 1 and 2.

Some brands of chromicized catgut have a low tensile strength. The Australian made chromicized gut which was tested proved to be most satisfactory and withstood two sterilizations and two cultures without much loss of tensile strength. Number 1 size had a tensile strength of seven and a half pounds after a first sterilization and culture, and of six and a half pounds after the second sterilization and culture. Number 2 size had a tensile strength of eight and a half to nine pounds before the second sterilization and culture, and of eight pounds afterwards. Number 3 had a tensile strength of from twelve and a half to fourteen pounds before the second sterilization and culture, and of nine to thirteen pounds afterwards.

FIGURE III.

Ligatures size 2, twice sterilized and cultured, dissected from a guinea-pig after thirty days. One of these is still densely surrounded with fibrous tissue. The knots are intact.

In contrast, the tensile strength of the imported brand tested after two sterilizations and cultures was for Number 1 three and a half to four and a half pounds, for Number 2 four and a half to five and a half pounds, and for Number 3 four and a half to six and a half pounds.

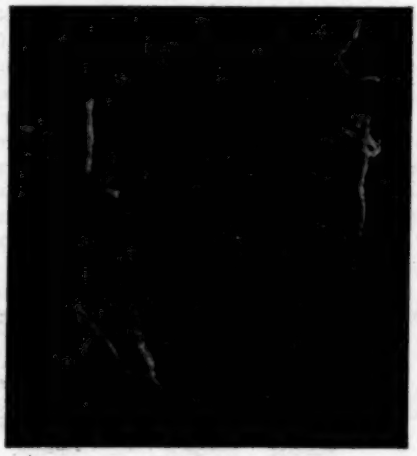

FIGURE IV.

Ligatures, three times sterilized and cultured, (sizes 1 and 0, from above downwards) dissected from two guinea-pigs thirty days after implantation. In one guinea-pig (left) the size 0 suture had disappeared and the knot in size 1 came untied during dissection. In the other guinea-pig (right) the size 0 ligature was partly digested and a fragment was torn off in dissection. The knot in the size 1 ligature was intact.

Summary.

The results of these various experiments and of a number of others which gave similar results emphasize the importance of the sterility of the solutions, especially those containing no iodine, which are used in the preparation, storage and

testing of catgut. Alcohol must be regarded as a fluid which, so far as sporing organisms are concerned, is normally neither sterile nor bactericidal. It must be sterilized for use for these purposes as well as for general use in aseptic surgery. The presence of 0·1% iodine in alcohol used for the storage of catgut is a valuable safeguard against accidental contamination.

Not all tubed catgut is sterile. This is notoriously so in the case of chromicized catgut.

For use in hospitals catgut may be sterilized by the iodine method and cultured in bulk before being used. Storage in spirit after culture removes the swelling and slipperiness engendered by prolonged contact with culture media. The sterility of the catgut can thus be certified more surely than if reliance is placed upon results of sterility tests on fractions of a batch issued for use.

The importance of adequate precautions in the subsequent storage of sterilized catgut has been evident at every stage of this investigation. The plain and chromicized dry Australian catgut has proved, in our hands, thoroughly suitable for sterilization by the iodine method and compares favourably with the brands of imported catgut which have been tested.

Acknowledgements.

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CHRONIC GASTRITIS.[1]

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FOR practical purposes there are only three diseases of the stomach. Syphilis and tuberculosis undoubtedly occur, and such rarities as sarcoma of the stomach and non-malignant tumours are definitely known, but these are all outside the scope of everyday work, and for practical purposes the possibilities are limited to gastritis, peptic ulcer and cancer.

[1] Read at a meeting of the staff of the New South Wales Community Hospital on April 2, 1936.

There are few diseases which have passed through such diverse phases as gastritis. In 1833 William Beaumont demonstrated on his patient, Alexis St. Martin, who had sustained a gastric fistula, two distinct varieties of mucosal inflammation; one followed over-indulgence in alcohol, and the other occurred in a febrile attack which we should now term influenza.

These excellent clinical observations were forgotten during the subsequent era when pathological anatomy became the basis of medicine, because those lesions which might have kept pathologists cognizant of the results of gastric inflammation, were obscured by the autodigestion which occurs so readily *post mortem*. Since there was no control by the science of pathology, a purely empirical classification of gastric disease was built up, based on biochemical testing of the gastric contents, and the varying acidity and motility of the stomach were described as various forms of nervous dyspepsia.

With the advent of Röntgenology gross circumscribed lesions of the stomach so engaged the attention of members of the medical profession that the diffuse inflammatory changes of gastritis were almost forgotten. This tendency was aided and abetted by the surgeon who pronounced all but gross lesions as normal. However, the more recent advances in radiology have enabled the mucosal relief patterns of the stomach to be visualized and studied, and inferences have been drawn as to the thickness or atrophy of the mucous membrane as a whole.

Finally, the introduction of the method of directly bringing the gastric mucous membrane into view by means of a gastroscope has confirmed and enlarged these findings. Since the dawn of the present century Professor Knud Faber has been studying the pathological anatomy of the gastric mucosa. In order to eliminate *post mortem* changes, quantities up to half a litre of a 4% formaldehyde solution were injected into the abdomen immediately after death, fixation *in situ* thus being secured. As a result of these researches gastritis is now recognized as a perfectly definite and not very uncommon entity existing in several different forms, with a definite clinical picture and a characteristic test-meal chart.

To sum up, the modern conception of chronic gastritis is chiefly based on the results of pathological examination of gastric tissues fixed immediately after death, on clinical observations, on analysis of the gastric contents, and on the results of treatment.

Ætiology.

Investigations have shown that chronic gastritis occurs especially in middle and late life, and the incidence of the disease increases with advancing years. Faber, who holds that gastric anacidity is the first indication of a developing gastritis, reports achlorhydria in 50% of people above the age of

fifty years, the incidence in women being twice that of the male sex.

The commonest cause of chronic gastritis is surface irritation, mechanical or chemical, of the gastric mucosa by agents acting over long periods. Mechanical irritation may be due to bad cooking, to insufficient mastication from rapid eating or from missing dentures, or to the consumption of excess of coarse vegetable material. Condiments, strong tea and certain drugs, such as salicylates, iodides, mercury, digitalis and drastic vegetable purgatives, are all potent factors when taken over a long period. Alcohol is a very important factor, particularly when taken in concentrated form, such as whisky, brandy or gin, and especially when taken "on an empty stomach". It gives rise to the classical form of chronic gastritis which is becoming so common amongst the young people who frequent cocktail parties.

Morse is the authority for the statement that alcohol in excess of 10% arrests digestion, whilst below that point it can act as a stimulant.

In the experimental production of gastritis in dogs with gastric fistulæ, Einar Thomsen observed definite hyperacidity in the first stage of the intoxication; the hyperacidity gradually changed to subacidity with the continued administration of alcohol, and finally to true anacidity, that is, complete cessation of secretion.

Pus and organisms swallowed in cases of nasopharyngeal inflammation, *pyorrhœa alveolaris*, chronic tonsillitis, and infected material coming from the lung, as in bronchiectasis and phthisis, produce changes of a similar type.

Knud Faber has emphasized the importance in the production of gastritis of hæmatogenous infection following acute general infectious diseases, such as dysentery, influenza, scarlet and typhoid fevers, nephritis *et cetera*. All cases of irritation gastritis tend towards an achlorhydria, but it seems often to be very slow in developing, whereas it may appear very early in the hæmatogenous form.

Lastly, it should be remembered that chronic gastritis may be associated with many other gastric maladies, such as peptic ulcer, cancer and pyloric obstruction. In 1934 Franklin Hollander demonstrated that the secretion of the parietal cells was nothing more than a dilute solution of hydrochloric acid (pH about 0·9) isotonic with the blood, the chlorides of sodium and potassium, the phosphates and the nitrogenous and other buffers of the mixed juice being derived from the mucoid and chief cells *et cetera*. There is a good deal of evidence to indicate that when the gastric mucosa is subjected to disease it is the parietal cells which suffer first. Thus in patients with achlorhydria the concentration of neutral chloride is often normal, and it may be normal even in patients with the true anacidity of pernicious anæmia.

Further, in Kalk's case, in which a patient drank hydrochloric acid with suicidal intent, the secretion of gastric acid failed and he was left an alkaline juice with a normal content of chlorides. Again the patient drank hydrochloric acid, and this time with greater damage to the mucosa; the concentration of chlorides fell, and for four and a half months there was no secretion of acid, even after the injection of histamine. Later, the functions of both the mucoid and the parietal cells returned almost to normal.

Pathology.

The pathological changes in chronic gastritis are usually a combination of acute and chronic processes, for the course of the disease is commonly an alternation of latent periods with acute exacerbations. Two forms can be recognized, the "hypertrophic" and the "atrophic", the latter being almost certainly a later stage of the former.

The changes are most marked along the lesser curvature and in the pyloric region, and in the hypertrophic type the mucous membrane becomes thickened, rugose, opaque and mammillated. The characteristic histological features consist of hyperæmia, infiltration of the stroma with inflammatory cells, increase in the size and number of the lymphoid follicles, and a mild proliferation of the parenchyma. In certain cases the leucocytic infiltration becomes so intense as to cause destruction of the superficial tissues with the formation of erosions.

In the "atrophic" type the mucous membrane becomes thin, pale and smooth, and on microscopic examination the interstitial cellular infiltration becomes a fibroblastic one, with a varying degree of glandular compression, fundal cystic dilatation and atrophy. The secretion is usually thick, tenacious and mucoid, but in the diffuse atrophic form secretion not uncommonly is absent. This excessive production of mucus, so characteristic of the first-mentioned type, is probably protective in nature and indicates an infection or direct irritation of the surface cells.

Symptomatology.

Although Hurst has outlined a definite clinical picture, the symptoms as a rule are not sufficiently characteristic to afford accurate recognition without the aid of a test meal. In fact, the disease may run its whole course without producing any marked digestive symptoms, the condition being discovered only in the search for some other complaint—the so-called latent gastritis.

As gastric disturbances are chiefly the expression of motor dysfunctions rather than of secretory disorder, changes confined to the mucosa would be unlikely to give rise to frank gastric phenomena, with the possible exception of hæmorrhage, although such indirect symptoms as anæmia and diarrhœa frequently occur. In this respect, therefore, gastritis does not differ from the morbid physiology of acute peptic ulcer.

When symptoms occur, they are as a rule not continuous; periods of dyspepsia alternate with

intervals that are quite latent, but the periodicity, nevertheless, is never so characteristic as with peptic ulcer.

The most common disturbance is epigastric fullness immediately after meals, frequently accompanied by nausea. The latter occurs especially in the early morning, but may last throughout the day. Belching of gas and post-prandial regurgitation of sour fluid are common symptoms. A defective appetite, particularly for meat, and a longing for relishes, chutneys and sauces are not uncommon.

In general the symptomatology of advanced chronic gastritis mimics either that of chronic cholecystitis or duodenal ulcer. In spite of the presence of achlorhydria, "heart-burn" and "acid regurgitation", which are relieved by sodium bicarbonate, may occur. Anæmia not infrequently complicates the picture and will be referred to more in detail later on.

Physical Signs.

Physical examination may reveal no abnormality. In some cases, however, cutaneous and muscular hyperæsthesia may be found. The patient commonly has a furred tongue as well as foul breath, but the tongue cannot be regarded as a good guide to the condition of the gastric mucosa.

Gastric Analysis.

Gastric analysis is of the greatest value in cases of chronic gastritis, not only as regards its recognition, but also as an index of its cure. Microscopic examination of the resting gastric juice usually reveals an increase in the number of leucocytes. A sign of great significance is the presence of mucus in most or all the samples of the test meal.

In addition to its alkaline properties, mucus adheres to the surface of the mucosa and frequently blocks the mouths of the secreting tubules. Hence hypochlorhydria or achlorhydria is commonly present, owing either to the presence of mucus or to atrophy of the oxyntic cells. It therefore follows that a preliminary lavage or an injection of histamine may lead to reappearance of hydrochloric acid, provided the condition has not progressed so far that glandular atrophy has become the dominant feature.

By the above methods it is possible to differentiate between achlorhydria due to permanent inability of the gastric mucosa to secrete acid—true *achylia gastrica*—and secondary anacidity due to neutralization of the acid by an excess mucus, or to the regurgitation of bile and pancreatic juices. In the former group most of the cells secreting pepsin are also destroyed, and even if all active inflammation is overcome by treatment, restoration of gastric secretion is impossible.

Norbert Henning gives the following figures for the different acidity types in simple chronic gastritis: hyperacidity, 11%; normal acidity, 21%; hypoacidity, 32%; secondary anacidity, 21%; and true or histamine-refactory anacidity, 15%.

Radiological Examination.

Owing to recent improvements in the technique of X ray examinations it has become possible to visualize and to demonstrate satisfactorily the rugæ of the stomach both in health and disease. In the body of the stomach the rugæ are chiefly parallel to the lesser curvature, but in the vicinity of the greater curvature they tend to arrange themselves in an oblique fashion. Surrounding the fundus there are, in addition, numerous circular rugæ. In the pyloric region they usually run parallel to both curvatures, and no circular rugæ are present.

In hypertrophic gastritis these folds become thickened, elevated and more tortuous, and frequently present a mottled appearance owing to their not all being in the same plane. The serrations of the profile seen in the region of the greater curvature are always exaggerated.

On the other hand, with chronic atrophic gastritis the rugæ, being thinned out or destroyed, are difficult to visualize, but on increasing the ingestion of barium the outline of the stomach is found to be regular, and peristalsis is not interrupted (compare early carcinoma). The radiological appearances of this type may closely resemble those of the transverse or so-called hypersthenic stomach. Peristalsis may be equally active and the stomach equally short, but the pyloric canal appears to be constantly patent instead of opening only when peristaltic waves approach it. In fact, it is not uncommon to meet with patients who have recently undergone one or more courses of intensive alkaline treatment in spite of the fact that their oxyntic cells had long since ceased to function.

Complications.

Gastritis has been demonstrated as being of great importance in the genesis of diseases so varied and common as the following:

1. *Nutritional or Anhæmopoietic Anæmias* (Wintrobe, Castle, Witts).—The achlorhydria precedes, accompanies and persists after the cure of the blood condition, but whereas the enzyme hæmopoietin (or Castle's factor) is shown to be entirely absent in pernicious anæmia, investigations reveal that it is usually reduced only in microcytic hypochromic anæmia.

There is a striking gradation in the severity of the gastritis accompanying these anhæmopoietic anæmias, as is shown by examination of the histamine juice. The reductions are seen to affect all the elements investigated, namely, ten-minute volume secretion, the hydrochloric acid, total chloride, pepsin, insoluble mucus and soluble mucoprotein.

In those cases of simple achlorhydric anæmia characterized by an absence of hæmopoietin there must be some other source of this factor (possibly Brunner or cardiac glands) in order to prevent the development of megaloblastic degeneration of the marrow, otherwise the transformation of a simple anæmia into one of the pernicious type would be of common occurrence.

Incidentally, Mether and Minot have shown that iron is not easily absorbed from the small intestine in achlorhydria, but it is at present uncertain whether this is due to there being no hydrochloric acid to convert the organic iron of the food into a form suitable for absorption, or to a failure of absorption by the small intestine, which is so frequently in an unhealthy condition in this malady. The Plummer-Vinson syndrome should be included in this group.

2. *Subacute Combined Degeneration of the Spinal Cord* (Hurst, Wilkinson).—Although produced by the same glands, and acting in a similar manner, "neuropoietin" is not identical with hæmopoietin, as either may be absent from the gastric juice whilst the other is present. In the pre-liver therapy era degeneration of the posterior and lateral columns of the spinal cord were found in only 85% of the fatal cases of pernicious anæmia.

3. *Chronic Diarrhœa* (Hurst).—Chronic diarrhœa may signify the presence of sprue, pellagra or other deficiency disease, but as a rule it is indicative of so-called gastrogenous diarrhœa, first described by Oppler. The mechanism of its production is still a matter of dispute; the supporters of the mechanical theory claim that undigested food passing from the stomach irritates the intestine, whilst the infective theory supporters hold that it originates through organisms escaping destruction in the stomach owing to loss of the normal antiseptic barrier.

4. *Chronic Cholecystitis and Hepatitis* (Mallory, Wilson).—Cholecystitis is frequently associated with achlorhydria and is generally due to an ascending *Bacillus coli* infection from the duodenum (Hurst, 1932).

5. *Carcinoma of the Stomach* (Hurst and Stewart).—One-half to three-fifths of all gastric cancers are associated with achlorhydria. The cancer is alleged to develop on the basis of an unhealthy mucosa, the gastritis and achlorhydria preceding the development of the carcinoma. The commonest type of associated anæmia is a simple microcytic anæmia, but Wilkinson has collected some twenty-five cases of the pernicious type. The importance of this observation is that both anæmias may for a time respond to their respective remedies and the growth may be unsuspected. Further, too much reliance cannot be placed on the reticulocyte response test in differentiating between pernicious anæmia and gastric carcinoma.

6. *Gastric Syphilis.*—Although comparatively rare in comparison with gastric carcinoma, gastric syphilis is more frequently associated with achlorhydria than is any other organic lesion of the stomach.

7. *Acne Rosacea and Scleroderma.*—Gastritis must also be considered in connexion with *acne rosacea* and scleroderma.

8. *Chronic Arthritis and Fibrositis.*—According to different authorities, one-fifth to one-half of all cases of chronic arthritis and fibrositis are associated with achlorhydria.

Treatment.

In every case of chronic gastritis thorough treatment should be attempted, even in advanced cases, because not only is it possible to relieve symptoms, but also to effect a cure in the majority.

Gastric lavage, combined with judicious feeding and the removal of all causal factors, would appear to be the main essentials. A complete overhaul should therefore be instigated for all sources of open or focal sepsis, especially in the mouth, pharynx and accessory sinuses of the nose.

Smoking before meals and alcohol taken on an empty stomach should be forbidden. Restoration of gastric acidity may often be brought about by the old-fashioned treatment of gastric lavage. This is most conveniently carried out by introducing into the stomach a number 38 French lavage tube, or a Senoran's evacuator, withdrawing the residuum and then washing out the stomach with the selected solution.

A 1% bicarbonate of soda solution has been used by many, but a more effective solution is one to four drachms of hydrogen peroxide to the pint of water. Five to six quarts at body temperature may be used in quantities of from six to ten ounces at a time, and at a pressure not exceeding forty inches of water. The best time for this lavage is in the early morning before any food has been taken, and it should be repeated daily until mucus fails to appear in the return flow. (82% cases, Hartfall, 1932.) In favourable cases an average normal test-meal curve should reappear after about four weeks.

It is a good plan to give the patient nothing but milk or milk foods for the first week or so, and subsequently the food should be mechanically and chemically non-irritating, taken at regular intervals, and well masticated.

Medicinal treatment is not considered to be of great assistance in chronic gastritis. Paradoxical as it may appear, alkalis given before meals are powerful excitants for the secretion of hydrochloric acid. The most suitable alkalis for this purpose are magnesium oxide, magnesium peroxide and sodium bicarbonate.

In those cases of atrophic gastritis in which free hydrochloric acid does not reappear after gastric lavage, dilute hydrochloric acid may be administered by mouth, as a substitution therapy with the object of preventing complications and controlling intestinal symptoms, such as diarrhœa. From one to two drachms of this acid are given thrice daily with meals in half a pint of water, to which the juice and pulp of an orange have been added.

In some obscure manner ordinary pharmaceutical doses of from five to fifty drops of dilute hydrochloric acid may cause an alteration in pyloric tonus, counteracting the excessively rapid or premature evacuation of the gastric contents; but such amounts can have little effect on titratable acidity, for at least one and a half to two ounces are required in order to produce an approximately normal curve.

In a like manner substitution therapy should be practised in those cases in which the gastric secretion is shown to lack "hæmopoietin". It will be obvious that the most effective "gastric tissue" will be that prepared from the entire thickness of the pyloric portion in contradistinction to the whole organ, the average maintenance dose of such a preparation being one-third of an ounce or ten grammes (one and a half level dessertspoonfuls), equivalent approximately to half a pound of whole fresh stomach daily. It may be taken suspended in broth, milk, water or fruit juice. The unpleasant taste and smell may be mitigated to some extent by exposing the next day's ration in a saucer to the air for twenty-four hours. During the initial stages of the treatment one-third of an ounce should be administered for each one million reduction of the red blood cells below normal, and for the first two weeks of such treatment a reticulocyte count should be carried out on alternate days in order to gauge effectively the progress made.

On the whole, the administration of gastric tissue is probably best adopted as a routine from the points of view of economy, convenience of administration and effectiveness, for there are very few patients with pernicious anæmia who cannot be kept with a hæmoglobin value between 95% and 100% upon an ounce of desiccated stomach tissue a day, at a cost ranging from about one shilling and twopence to four shillings and sixpence *per diem*.

Another possibility is half to one and a half pounds of lightly cooked liver each day, but owing to its nauseous taste there are few subjects who will persist in such treatment.

Fortunately, liver fractions, in both dried and liquid forms, and preserving in high concentration all the active principles of fresh liver, have secured official recognition in the "British Pharmacopœia" of 1932; but for some extraordinary reason these preparations do not appear to be available in Sydney. In other words, if *"Extractum Hepatis Siccum* (B.P.)" is prescribed, the patient receives from the pharmaceutical chemist one of the various proprietary preparations of desiccated liver.

The average maintenance dose of dried or desiccated liver is one and a half ounces daily (five level dessertspoonfuls), equivalent roughly to seven and a half ounces of fresh liver, and costing from one shilling and eightpence to two shillings and sixpence *per diem*.

The powder may be stirred into soup, milk, orange juice or other beverage, or may be spread on a slice of bread and butter and seasoned with Worcestershire or tomato sauce.

At the same time the patient should be placed on an ordinary mixed diet, rich in fruit, fresh vegetables and red meat, and augmented by certain vitamin preparations, such as "Bemax" or "Marmite", half an ounce daily.

During the initial two months of treatment ferrous salts should be administered in order to compensate for the temporary iron shortage originating from excessive erythrocyte production.

Purely from the point of view of cost to the patient, treatment by intramuscular injections given twice weekly will prove more expensive than mouth preparations. Large doses of these products for intramuscular use have, however, been utilized to form depôts within the body without ill results. These depôts are slowly used up and need replenishing at longer intervals of time, say at monthly or bi-monthly intervals.

In emergency, liver preparations for intravenous use may be used, a dose of five cubic centimetres (equivalent to four ounces of fresh liver) calling forth a reticulocyte response within twenty-four hours. From two to four cubic centimetres may be given on the following day, and subsequently daily intramuscular injections, say two cubic centimetres, according to the magnitude of the blood response and the clinical progress of the case. Within a week or ten days these patients can be given preparations by mouth and, finally, by trial the maintenance dose can be determined.

Transfusion nowadays is needed only when severe infection inhibits the response to an active preparation.

All patients with pernicious anæmia should be kept under regular supervision, and should be examined at monthly or bi-monthly intervals to see that their hæmoglobin value is maintained above 90%, the development of subacute combined degeneration of the spinal cord being thus avoided.

The microcytic hypochromic form of anæmia is most successfully treated with massive doses of iron, preferably as one of the ferrous salts. When the anæmia has been repaired, a generous diet and a maintenance dose of ten grains of freshly made Blaud's pills will usually be sufficient. Infection, sepsis, pregnancy and lactation all inhibit the response of these patients to iron.

Achlorhydria.

In conclusion, a few remarks with regard to the modern conception of achlorhydria may not be out of place. This condition is neither a disease nor a definite entity, but merely a functional secretory state which may be temporary or permanent and which shows a steady increase in incidence from youth to old age. It is definable as that condition in which there is an absence of free hydrochloric acid from the gastric juice.

Knowing that a certain degree of acidity (pH_3) can in practice be due only to hydrochloric acid, direct chemical testing of the gastric secretion is generally dispensed with, and the reaction to Töpfer's reagent (di-methyl-amino-azobenzol) substituted. If no fraction of the gastric test meal turns red with this indicator, achlorhydria is generally accepted as being present.

Two opposing views dominate medical opinion with reference to the causation of the condition: one, formulated in 1897 by von Martius, maintains

that achlorhydria arises as an inborn error of secretion without any structural changes being demonstrable in the mucous membrane, whilst the other believes the condition to be the result of a gastritis (Hayem and Faber, 1913).

Although achlorhydria may occur in many members and several generations of one family, may not this be due to a mucosa of a functionally subnormal type which is readily affected by those injurious agencies prone to cause gastritis? On the other hand, although gastritis is regarded by the majority of gastro-enterologists as being the main cause of achlorhydria, there is no doubt that a small group of cases exists in which no anatomical change can be demonstrated in the mucous membrane. For instance, achlorhydria is found in approximately 40% of cases of exophthalmic goitre, and the institution of successful surgical treatment is alleged to lead to the reappearance of gastric acid in about three-quarters of the patients.

Further experimental feeding with thyroxin has produced achlorhydria in both dogs and humans. The anæmia accompanying exophthalmic goitre is usually of the secondary microcytic type, but the association of Graves's disease and pernicious anæmia is by no means unknown; in fact, ten such cases reported by Meulengracht and Hartfall were all in females and all had achlorhydria.

Further, in both beri-beri and pellagra (60% of cases) achlorhydria is not a very uncommon finding, and B. P. Babkins has recently published an account of a series of experiments on dogs, in which the secretion of hydrochloric acid diminished greatly through a lack of vitamin *B* (*F* and *G*) and became normal again after the ingestion of yeast. Psychical achlorhydria arising from emotional upsets or hypnotic states *et cetera* is a transitory condition and therefore outside the scope of this paper.

ANTE MORTEM CLOTS IN THE CHAMBERS OF THE HEART.

By J. BURTON CLELAND, M.D.,
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IN the chambers of the heart *ante mortem* clots are not infrequent. In any hypertrophied and dilated heart with back pressure extending to the auricles, *ante mortem* clots, usually small, may be met with in the recesses of the auricular appendages. Sometimes these clots are larger and may fill the distal part of the appendix; and occasionally a clot may become detached but be still retained within the chamber of the auricle and may grow in size, constituting a ball thrombus. Again, in coronary disease, when the nutrition of the heart muscle has been interfered with, and especially when this has led to infarction, *ante mortem* clots are apt to form in the ventricular chambers themselves, and especially on the septal wall of the left ventricle.

In 3,000 *post mortem* examinations at the Adelaide Hospital *ante mortem* thrombi were found in the heart in 69 cases. In 40 of these clots were present in the auricles, and in 30 on the ventricular walls; in one case, as indicated by the figures, clots were present in the right auricle and on the ventricular wall as well.

Ante Mortem Clots in the Auricles.

Clots were present in the right auricle in 23 cases; in the left auricle in eight cases; in both auricles in eight cases; and in one case in the right auricle and also on the ventricular wall.

In analysing the cardiac conditions associated with these *ante mortem* thrombi, we find that a hypertrophy and dilatation of the heart not due to valvular disease, but mostly due to hyperpiesis without obvious renal disease, was the commonest pathological lesion. The next most common condition was mitral stenosis.

Hypertrophy and Dilatation of the Heart not due to Valvular Disease.—Twenty-two of the 40 examples come under this category. In 12 of these the hypertrophy was attributed to high tension and was not associated with a predisposing renal condition. Eleven of the 12 patients were males, and the ages varied from 52 to 73. In three cases the hypertrophied and dilated hearts were associated with granular contracted kidneys; two of the patients were males aged 54 and 70, and one a woman aged 81.

Hypertrophy and dilatation of the heart due to syphilitic disease of the aortic valve were responsible in the cases of three males, aged 48, 58 and 65. Hypertrophied and dilated hearts with syphilitic aortitis, but without valvular disease, were met with in two males, aged 32 and 56. Exophthalmic goitre associated with a hypertrophied and dilated heart was present in a woman of 39. In a woman of 80 the heart is merely recorded as dilated.

In examining the above results it is interesting to note that only four cases occurred in women and that the hypertrophied and dilated hearts attributed to hyperpiesis all occurred in persons over 52, and more particularly in persons in their sixties and seventies. This applies also to the three cases in which renal disease was associated with a hypertrophied heart. When syphilitic disease was associated with the heart condition, the age tended to be younger. All the five cases of a syphilitic nature were in males.

Mitral Disease.—In 10 of the 40 cases there was old rheumatic disease of the mitral valve, in seven cases resulting in mitral stenosis alone, in one in mitral and aortic stenoses, in one in mitral and tricuspid stenoses, and one is recorded as mitral regurgitation. Of these ten cases, nine occurred in females, the ages of whom were 27, 28, 30 (two cases), 31, 37, 45, 49 and 50. The age of the male was 47.

It is interesting to notice here the reversal in sex, nearly all the cases being in women relatively young.

Diphtheria.—In two cases the thrombi were associated with diphtheria. Thus in a girl of 10 there were thrombi in the left auricular appendix, an embolism in the middle cerebral artery, and infarcts in the spleen and kidney; death in this case seemed definitely the result of the formation of thrombi in the auricular appendix. The other example was in a boy of 15, who had a large superficial ulcer of the groin and who died suddenly. On reviewing the case after the *post mortem* examination it seemed likely that the ulcer, which was not a deep one, had become infected with diphtheria bacilli; in sections organisms which resembled diphtheria bacilli were seen. Here there was an *ante mortem* clot in the right auricular appendix.

Pulmonary Tuberculosis.—In chronic pulmonary tuberculosis with much fibrosis of the lungs, hypertrophy and finally dilatation of the right ventricle may take place, with resulting back pressure and distension of the right auricle. In only two of the 40 examples was pulmonary tuberculosis responsible for the condition; the patients were both women, aged 29 and 55.

Other Conditions.—Vegetations on the tricuspid valve were present in a male of 42. Two elderly males, aged 79 and 84, had pneumonia at both apices, hypostatic in one and irregular in the other. A woman, aged 48, suffered from locomotor ataxia and had pyelitis.

Ante Mortem Clots in the Ventricle.

As might be expected, coronary disease was responsible for most of the clots attached to the ventricular walls, occurring in 17 of the 30 cases. Coronary disease leading to infarction seems to impair the vitality of the endocardium covering the affected area, even though the nutrition of this endothelium is probably chiefly derived from the blood in the chamber. It may be also that the underlying degenerated or fibrosed wall, not participating fully in the ventricular contraction, being flabby or rigid, may give rise to a shallow pocket in which the blood is relatively stagnant, and thus platelets are able to drop out of the circulating stream and initiate a thrombus. The next most common associated condition was hypertrophy and dilatation of the heart not due to valvular disease, which was present in more than one-quarter of the cases, namely, 8 out of the 30.

Coronary Disease.—Coronary disease was responsible for 11 cases in males and six in females. The ages of the males were 40, 58 (with a hypertrophied heart), 64, 65, 69, 71 (with a hypertrophied and dilated heart), 71, 74, 76, 80, and one was described merely as "an old man". In women the ages were 56, 58, 60, 66, 70 and 78. It will be seen that only one patient was in the forties (a male aged 40), and only three (two of these women) were in the fifties. Coronary disease was thus in nearly all cases an associate of old age.

Hypertrophy and Dilatation of the Heart not due to Valvular Disease.—It is interesting to note the occurrence of clots on the walls of the ventricles in these cases apparently unassociated with coronary disease. There were six examples attributed to hyperpiesis, three in males, aged 30, 41 and 42; and three in females, aged 34, 46 and 64. The two other cases were associated with granular contracted kidneys in males aged 29 and 63. In contrast to the examples showing coronary disease, it would seem that most of those with hypertrophied and dilated hearts were relatively or actually young.

Various Lesions.—In the remaining five cases various lesions were present, as follows: Mitral valve thickening with chronic nephritis in a woman of 79; abscess in the lung with pneumonia in a man of 58; hæmosiderosis in a man of 57; and aortic stenosis, calcification of the mitral valve and hypertrophy of both ventricles in a man of 61. The remaining case was that of a patient with squamous epithelioma of the œsophagus, who had a deposit in the heart wall on which vegetations had been deposited. The vegetations of rheumatic fever and of malignant endocarditis are not included.

Ball Thrombi.

There were three examples of ball thrombi in the auricles, all on the left side, one being in the main chamber and the other two in the appendix. In another case, that of a woman of 34, with a hypertrophied and dilated heart weighing 766 grammes (twenty ounces), there were *ante mortem* clots on the wall of the left ventricle, and a separate clot, which seemed to be a ball thrombus; the patient had chronic venous congestion and infarcts in various organs. The three patients with thrombi in the left auricle were aged 27, 45 and 50, and all had mitral stenosis. Such a ball thrombus loose in the chamber must interfere seriously from time to time with the flow of blood. One would think that it might temporarily block the stenosed orifice of the mitral valve, with resulting sudden stoppage of the circulation and fainting.

Summary.

1. *Ante mortem* clots were present in the chambers of the heart in 2·3% of 3,000 *post mortem* examinations.

2. In 40 cases clots were present in the auricles, and in 30 on the ventricular walls.

3. *Ante mortem* clots in the auricles were present on the right side in 23 cases, on the left side in eight, on both sides in eight, and in the right auricle and on the ventricular wall in one. Hypertrophy and dilatation of the heart not due to valvular disease were the commonest associated conditions (22 cases out of 40). Mitral disease was responsible for 10. Two cases occurred in the course of diphtheria.

4. The most common cause of *ante mortem* clots on the ventricular walls is coronary disease, followed next by hypertrophy and dilatation of the heart not due to valvular disease.

5. Three examples of ball thrombi in the left auricle were all associated with mitral stenosis.

Reports of Cases.

TUBE AND OVARY IN THE INGUINAL HERNIA OF AN INFANT.

By E. R. ROSEBY, M.B., Ch.M. (Sydney),
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G.F., A FEMALE aged four months, was brought with a swelling in the left groin on June 15, 1936. The mother had noticed the lump only the day before. The baby weighed only 2·9 kilograms (six and a half pounds) and looked generally under-nourished and frail. The baby had not vomited. The lump measured 3·0 by 1·0 centimetres, felt rounded and tense, and moved freely in the inguinal canal.

At operation next morning the opening of the hernial sac revealed the Fallopian tube and a cystic ovary. The ovary could not be returned, so was tied off and removed. The child made a good recovery.

The condition may have been congenital and remained unnoticed until cystic change and enlargement attracted the mother's attention.

PINK DISEASE WITH FATAL HÆMORRHAGE.

By J. STANLEY REED, M.B., B.S. (Melbourne),
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As no record has been found in the literature of a similar case, the following report is of interest.

Baby C. was a male born by natural delivery. The child was breast fed and did well until the following was observed. On July 30, 1935, the child (then aged ten months) had been cross for three weeks, but it was being weaned; it had seven teeth and was getting the eighth. A rash was present on the body on and off and was getting worse at teething time. The weight was 9·0 kilograms (twenty pounds). Nothing definite was found on examination. The child was not seen again until November 15, 1935 (then aged almost one year). He had not taken meals so well for the previous three weeks. He was not so hungry, but four teeth had erupted since he had been seen previously. On November 14, 1935, he developed a tight chest and his breathing was heavy. The bowels were acting well. His temperature was 38·6° C. (101·6° F.) and he looked pinched. The weight was 8·3 kilograms (eighteen and a half pounds). He had a loose cough, but no abnormality was found in the chest. The abdomen, throat and ears were clear. The rash was definite, with evidence of scratching. The feet and hands were bluish and swollen and tended to peel. Pronounced hypotonia was present. Pink disease was diagnosed.

On November 16, 1935, the temperature was lower and the child was taking nourishment and was brighter. No definite photophobia was present. On November 17, 1935, the child's temperature was 37·8° C. (100° F.). He passed a nasty dark motion in the morning and a watery stool in the evening. He took food.

On November 18, 1935, early in the morning the child turned cold and bluish and looked as if he was dying, but rallied quickly. He had a motion containing blood—some altered and other bright. His temperature was 37·6° C. (99·8° F.). Later melena was evident and some clots were passed. Still later the child's temperature was 38·9° C. (102° F.) and he passed further tarry motions.

The child, who was seen in consultation by Dr. J. D. Begg, took fluid well, and his general condition was moderately good.

On November 19, 1935, at 5 a.m., profuse blood was passed by the bowel; the child collapsed and was dead when I arrived.

Post mortem blood was found in the caecum and large bowel, but the bowel appeared clear above. No definite lesion was detected, but bleeding seemed to be from oozing in the bowel. Right basal pneumonia was present.

Comment.

No other cause than pink disease could be found. There were no hæmorrhages elsewhere, such as purpuric lesions on the skin. In the light of this experience, early transfusion might be suggested.

Acknowledgements.

I am indebted to Dr. Ian Wood and Dr. J. D. Begg for advice regarding this case.

Reviews.

HISTORY OF TUBERCULOSIS.

FOR several years Dr. E. B. Krumbhaar, of Philadelphia, has been editing, under the general title of "Clio Medica", a series of handbooks describing concisely various phases of the long and complex history that underlies the great edifice of modern medical science. The most recent is on tuberculosis, both medical and surgical, from the pen of Dr. G. B. Webb, of Colorado Springs.[1]

Dr. Webb has read widely and presents his story in a clear and definite form, but the frequency of short quotations, all fully documented, renders the style somewhat disjointed.

He begins with the earliest archæological evidence recorded in pottery and mummified bodies, quotes freely from classical writers, Egyptian, Greek and Latin, and carries us on to the present day.

The book affords as adequate and readable an account of the subject as one could well expect in so small a volume; but we should have liked to find some mention of chronic miliary tuberculosis, of Ranke's complexes, of Rokitansky's immunity and Bier's hyperæmia, and more of Landouzy's work on "typho-bacillose" and tuberculous rheumatism, and of Webb's own contributions.

Misprints are pleasingly few, but foreign idioms and spellings sometimes annoy the British reader, and it is a shock to find Percival Pott described as a physician.

The pictorial illustrations are wisely chosen and well reproduced, except, unhappily, the portrait of Robert Koch on page 98 and the plate from his "*Die Ætiologie der Tuberculose*" (Berlin, 1884). The complete failure of this last is especially disappointing, as the plate, with its delightful demonstration of tubercle bacilli in the tissues, has frequently been successfully and beautifully reproduced, for example, in Mr. Stanley Boyd's translation published by the Sydenham Society in 1886, and in the memorial volume, "*Gesammelte Werke von Robert Koch*", 1912.

The book ends with a good bibliography of five and a half pages, an index of persons and an index of subjects both reasonably full; it is nicely printed and bound.

We thank the author for a scholarly work, the charm of which is enhanced by many literary quotations, some from English poets.

[1] "Clio Medica: A Series of Primers on the History of Medicine", edited by E. B. Krumbhaar, M.D.; XVI: Tuberculosis, by G. B. Webb, M.D.; 1936. Foolscap 8vo, pp. 220. Price: $2.00 net.

The Medical Journal of Australia

SATURDAY, JULY 11, 1936.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

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NUTRITION.

ACCORDING to the daily newspapers the advisory council appointed by the Federal Government to report on the nutrition and diet of the Australian people will shortly try to obtain information about the kind and the quantity of food consumed by the average citizen. The survey, it is stated, will include at first one hundred families in each city, and records of foodstuffs taken and of their cost will be kept for one month. An additional five thousand persons in each State are to be invited to keep a record for one full week; and students from each medical school will be asked to keep a record of home expenditure for a longer period. That this investigation is to be made is most satisfactory, though it must be admitted that its scope is not very wide. The tropical parts of Australia, for example, will scarcely be considered. We have no doubt that once the inquiry has been started, the need for its expansion will become apparent and that no effort will be spared to make it adequate.

The Queensland Branch of the British Medical Association has also been concerned with nutrition. Some months ago it appointed a Nutritional Research Committee under the chairmanship of Dr. Noel M. Gutteridge, and papers by members of this committee have been published in this journal. The committee has tried to awaken public interest and has contributed a seven-page "Nutrition Supplement" to *The Courier-Mail* of June 15, 1936. On the first page of the supplement is a "Nutrition Questionnaire", which it is hoped will be completed by persons in all income groups. The information sought includes the average weekly income of the family, the number of persons in the family, the number of children in the family and the sum of money spent each week on various articles of food which are set out *seriatim*. The hope is expressed that returns will be received particularly from the northern coastal towns and tablelands—from the tropical parts of the State.

If these two investigations are successfully carried out—the one extending over the whole Commonwealth and the other covering a portion of it—we may be in a position to determine whether Australians have a well-balanced diet. To determine the state of nutrition of the people is another and a very much more difficult matter. In a previous discussion on this subject (THE MEDICAL JOURNAL OF AUSTRALIA, February 1, 1936, page 175) it was pointed out that no physical or health standards for Australians had been determined, and that what was thought to be most suitable for the northern parts of Queensland might be unsatisfactory for southern Tasmania. The whole question is beset with difficulties and we must agree with Robert Hutchison, who stated recently[1] that "nutrition and its relation to health is a more complicated matter than is often realized and there is no subject which more requires cool and clear thinking". Hutchison utters a protest against the "pessimistic view" that defective nutrition is widely prevalent in Great Britain. He points out that of the under-nutrition or malnutrition that does exist a very large part is due, not to inability to get enough food of the right kind, but to such factors as lack of appetite, the consequence of urban and indoor life, educational strain among children, and

[1] *The Lancet*, March 14, 1936.

infective disease in early life, recovery from which has never been complete. To these he adds nervous wear and tear and psychological factors. There is no doubt whatever that he is right in his contentions.

In commending the subject of nutrition to the careful consideration of medical practitioners and in urging them to use every available opportunity of teaching the public what it needs to know about food and its consumption, we would ask them to take a balanced view of the situation. The "Nutrition Supplement" of *The Courier-Mail* was extremely valuable and might well be used as a model by other Branches, if they could find newspaper proprietors who were sufficiently public-spirited to give their cooperation. Every support must also be given to attempts to discover the state of the nation's diet, for this is the first and most essential step. At the same time there must be no exaggeration of possible results; no panacea must be promised to the people. In other words, there must be none of what Robert Hutchison calls the "undue optimism which believes that a great improvement in the public health can be brought about by altering the national diet".

Current Comment.

PNEUMOTHORAX THERAPY IN PULMONARY TUBERCULOSIS.

THE production of an artificial pneumothorax, according to J. W. Cutler,[1] is far the most important method of attack we may now employ in the treatment of pulmonary tuberculosis. Pneumothorax rests the diseased lung, which a sojourn in bed can never do while the lung is still expansile, and it subdues the toxæmia which is often out of all proportion to the extent of the tuberculous deposits. Pulmonary tuberculosis is a malady which, so far, must be attacked by indirect methods. No specific drug or any antitoxin will combat it. In the not very remote past the tuberculous patient relied for his cure upon milk, fresh eggs and rest in a "beneficial" climate. But the truth is that, just as milk and eggs may be bought in any suburban street, a sanatorium may do its work successfully either on a mountain top or in an urban area. The favourable influence of dizzy height upon pulmonary tuberculosis has been overrated in the past. In Switzerland, where much of the landscape rears itself upward to a height of fourteen or fifteen thousand feet, the death rate from tuberculosis is almost twice that of Holland, where an ordinary traffic dome is regarded as an important eminence. And if, as it appears, climate is not a therapeutic factor of moment, what of rest? Since he breathes, a tuberculous patient in bed cannot be said to rest his lung, even if he goes to bed on the top of Mount Everest. But by collapse therapy the diseased areas in his affected lung may be squeezed together, ending his toxæmia and stopping absorption, so that in a few weeks he may advance further towards cure than was possible after months or years of the older treatment. The improvement is quick and dramatic; but, though it is collapsed, the lung is still diseased. The chances for cavitation and for a spread of the infiltration still exist and will transmute themselves into fact if reexpansion of the affected lung is permitted.

The cure of pulmonary tuberculosis by pneumothorax is a process involving not months, but years. Probably in no "early" case is less than one year's treatment required, for the patient may grow fat, feel well and outwardly prosper, while the disease, as evidenced by X ray films, advances in a smouldering way. Even after a prolonged stay in a sanatorium relapses are common. Clinical improvement in signs and symptoms is usually rapid; anatomical improvement lags far behind. Whether the process of collapse be continued for two years, for five years, or for the remainder of the patient's life, these relative rates of progress are to be observed. But all the time the lung, as shown by X rays, exhibits its remarkable powers of healing. Cavities shrink and consolidation disappears, it may be in three years or in five; but it is advisable always to continue the treatment for a year or two after the skiagram shows that healing is complete. Injections of air give little trouble to operator or patient and are a small price to pay in order that an artisan may work, a student pursue his studies, or a woman bear children in safety. Rist has computed that 52% of persons with pulmonary tuberculosis may be cured by artificial pneumothorax, but of those treated otherwise only 8·5% recover. This is another way of saying that a patient with moderately advanced pulmonary tuberculosis subjected to lung collapse has a chance of ultimate recovery six times greater than that of a patient treated by other means.

Tuberculous patients and, above all, their dependants, are the major problem of most social service organizations in Australia today. To send a wage-earner to a sanatorium often means privation for his family and for the patient a life of boredom, filled with introspection and worry over urgent financial needs. In favourable cases collapse therapy carried out in the home or at a convenient clinic abolishes these bugbears almost at one stroke and eliminates the risk of contagion by the

[1] *The Journal of the American Medical Association*, April 18, 1936.

crouching tubercle bacillus. In favourable cases the sputum "becomes negative". If it does not, the chances are that the collapse is incomplete or that unsuspected disease is active in the other lung. Here is the opportunity of the efficient, experienced clinician in tuberculosis, who should regard himself as an unappointed and unpaid public health official of the highest importance.

To what may we attribute the very striking increase in popularity, and the no less amazing improvement in technique, which have lately marked the practice of artificial pneumothorax? The answer is that we have to thank radiology, and particularly the fluoroscopic screen. Forlanini, who flourished at the very moment when Koch stained and observed the tubercle bacillus, believed that a tuberculous lung should collapse in its entirety and turn to a sodden sausage beside the heart. Any assassin with a dagger can perform such an operation, but these are the days of selective collapse, of nicely selected injections into chosen parts of the two lungs wherein the bacillus makes merry. The fluoroscopic screen has compelled us to apply these methods to a growing number of patients. No longer need we burn down a whole house to roast one pig.

There are men who, free from signs and symptoms of tuberculosis and afflicted only by what seems to be a common cold, are yet suffering from a latent type of disease which may manifest itself at any time. Such people are "carriers" and need the same supervision and treatment as those with the outspoken disease. A three-months rest in bed may be their salvation; but if at the end of this time the disease has been shown by X ray examination to progress, treatment by artificial pneumothorax is the method chosen. The treatment of patients with so-called "closed" tuberculosis is subject to the same rules.

Artificial pneumothorax, as Cutler points out, is an indirect method of attack, not a specific one. But it does rest the diseased portion of a lung, lessen the effects of toxæmia, encourage fibrotic change, and asphyxiate the tubercle bacillus. Whenever, as demonstrated by X ray examination, more than 50% of a patient's lungs is destroyed by widespread bilateral disease, or he himself is suffering from some coincident disease which will itself kill, the operation is not only useless, but dangerous. Sufferers from hypertensive arterial disease are included in this category, as they cannot withstand any alteration of intrapleural pressure; but organic valvular lesions of the heart, such as mitral stenosis and regurgitation, are not a contraindication to the treatment so long as the compensation is maintained. In the matter of age, there are limits to the useful possibilities of artificial pneumothorax; it has been employed in the treatment of sexagenarians and upon infants five months old; but persons over fifty are in general intolerant subjects, for the reason that weakened cardiac muscle and degenerating arteries cannot adapt themselves to sudden pressure changes. Asthmatic attacks are not infrequently the evidences of an allergy produced by pulmonary tuberculosis, and in their presence pneumothorax should be induced in patients otherwise suitable for it, for the asthma may cease with the healing of the lung.

Air injection is strongly contraindicated in the absence of free pleural space over the diseased lung or in the presence of adhesions which bar the closure of a cavity. In such conditions the operation may be not only ineffective, but result in sudden death from air embolism or hasten the development of a tuberculous empyema. The operation indicated is phrenectomy or thoracoplasty.

The chief and practically the only danger inherent in pneumothorax therapy is that of air embolism. In practised hands it should never occur, for it is the result of faulty technique—of efforts either to inflate a non-existent pleural space or to allow air to flow through an improperly placed needle. Pleural shock, though not uncommon, is rarely of consequence, and deaths attributed to it are due, almost certainly, to air embolism. Pleural effusions, which occur in 90% of patients undergoing treatment by artificial pneumothorax, usually disappear in time and are of benefit in decreasing the permeability of the pleural membrane to air. Even if these effusions are tubercle-laden, at least half of them spontaneously disappear. Aspiration and air replacement prevent their exerting any unfavourable influence upon ultimate cure, and their very appearance may be avoided by the institution of collapse at an early date.

Artificial pneumothorax has been of great value in preventing the spread of contralateral lung disease and in lessening the dangers of pulmonary hæmorrhage. It is also a check to the dissemination of tuberculosis by the lymphatics, blood stream and bronchi. Every arrested case of pulmonary tuberculosis means a lowering in the incidence of the disease in other organs—in the intestines, the larynx and the meninges.

It is doubtful whether adequate use has been made of artificial pneumothorax by the practitioners of Australia. They need to have its advantages brought to their notice and to be instructed in its technique; the several post-graduate committees would therefore do well to institute special courses in artificial pneumothorax therapy.

THE PREDICTION OF THE BASAL METABOLIC RATE.

THE value of estimation of the basal metabolic rate is well known, chiefly in relation to thyreotoxicosis. The correct relation of the laboratory process of calorimetry to the clinical evaluation of the patient's condition is best illustrated in well-equipped public hospitals, where the necessary tests

can be simply carried out and repeated whenever necessary. The position is by no means parallel in private practice, where hospital equipment is usually lacking and where financial considerations often hamper the carrying out of the serial observations which are so important. In order to devise some simple short-cut method of predicting the basal metabolic rate, several formulæ have been devised, but these have not proved very reliable, as shown by the studies of Frank, published recently in this journal. That there is a relation between pulse rate and metabolic rate has been known for a long time, and that this relationship was associated with oxygen consumption was shown a number of years ago. Continental workers have shown that a rise in the minute volume of the heart may be demonstrated in cases of thyreotoxicosis even before a certain rise is found in the basal metabolic rate. Here, of course, the difficult question of technical methods is involved. The problem is whether we can estimate the rate and degree of blood flow with reasonable accuracy by any simple method and thus make use of its parallelism with the consumption rate of oxygen. Read's formula, or one of its simplified forms, has been widely used, but has proved to be liable to a wide fluctuation of error. Gales suggested the simpler formula, B.M.R. = P.R. + P.P. − 111, but this also gave but a rough and ready estimate.

J. M. Read and C. W. Barnett have now reopened the question and have attempted, not to manufacture an equation by reducing the data to a linear ratio, but theoretically to deduce an equation fitting the relationship of oxygen consumption, pulse rate and pulse pressure, and then to determine the constants necessary to adjust this to the data under different conditions.[1] They deduce that the blood flow is equal to the product of pulse rate, pulse pressure and surface area multiplied by a constant, and find that this is supported by experimental results. It follows, therefore, that the heat production of the patient divided by his surface area equals the product of pulse rate, pulse pressure and a constant, assuming, of course, that all observations are made under basal conditions. In their clinical inquiry the authors rejected cases in which the diastolic blood pressure exceeded 90 millimetres of mercury, and also those with cardiac irregularities. They point out further that the error in clinical calorimetry is not negligible, the average difference found in two estimations done at the same time on the same patients being 7·5%. Taking this into consideration, they found that their results obtained by formula tallied very well with those given by actual biochemical test and were superior to those obtained by other formulæ. Their revised formula is as follows: for women, calories per square metre per hour = 0·0047 × P.P. × P.R. + 23; for men, calories per square metre per hour = 0·0055 × P.P. × P.R. + 24. It will be seen that these formulæ take into consideration the normal standards of variation, and the authors append a table containing the necessary figures for predicting the metabolic rate at different ages, the accepted standards for age and surface area being used. These tables may be commended to clinicians as an improvement on the old formulæ. Though derided by biological chemists, these short cuts have a certain value. As Read and Barnett remark, prediction formulæ seldom show an abnormal rate in a normal person, and it is useful to know whether further investigation is indicated in doubtful cases. They conclude their paper by pointing out that the pulse rate and pulse pressure estimated carefully before the patient rises in the morning may in many cases yield a more accurate result by the application of a formula than the basal metabolic rate calculated on data obtained after the patient has dressed and travelled some distance to a laboratory. This, of course, does not in any way constitute a criticism of the laboratory test, which should be carried out under strictly basal conditions, but the statement contains a useful hint for the physician.

[1] *Archives of Internal Medicine*, March, 1936.

SELF-PERFORMED SURGICAL OPERATIONS.

IT is easy to imagine circumstances in which a medical practitioner would be compelled to undertake a surgical operation on his own body. At the same time one cannot imagine that a medical practitioner would choose to act as his own surgical patient. J. G. Frost and C. C. Guy have published a short account of instances in which persons are known to have subjected themselves to their own surgery for therapeutic reasons, either actually or supposedly indicated.[1] They divide the cases into four major groups. The first group comprises surgeons who have operated on themselves. The second group consists of normal-minded persons who have been forced by severe pain or by the absence of medical attention to perform autosurgery. The third group includes sexual perverts and those suffering from an acute psychosis, intense sexual excitement, or anger resulting in self-inflicted mutilations or amputations, usually of the genitalia. The fourth group consists of those who, because of utter ignorance or feeble-mindedness, have attempted the surgical correction of some obvious disease or abnormality.

The first group is curious. First comes a French surgeon, Reclus, who in 1890 removed a tuberculous lesion from his own finger under local anæsthesia, curetting the wound after removal of the lesion. A Turkish surgeon resected his own scrotum for a large varicocele. A Roumanian and a Frenchman performed herniotomy, and two Americans performed appendicectomy on themselves. It is reported that a French surgeon, aided by a mirror,

[1] *The Journal of the American Medical Association*, May 16, 1936.

removed a calculus from his own bladder. Frost and Guy remark pointedly that in these cases apparently no question was raised as to the sanity of the patients.

Except to mention a patient who performed Cæsarean section on herself because of intolerable pain, the second and third groups may be passed over. The fourth group includes an interesting case that came under the notice of Frost and Guy. The patient, a man of forty-nine years of age, is described as "feeble-minded, but not committable". He was not aware that he could be treated in hospital without having to pay fees. He suffered from pain and swelling of the right testicle. He had seen animals castrated, so he removed his own right testicle with a penknife which he had cleaned and sharpened. The operation was painful, but no excessive bleeding occurred. The patient made no attempt to suture the wound, and healing took place slowly. The patient also had an inguinal hernia and was advised to wear a truss. One morning, when the hernia was causing him pain, he made an incision into the sac; he pulled out a loop of intestine, and, finding an area that looked "rotten", cut it off. It was then that he came under the care of Frost and Guy. Abdominal section and intestinal anastomosis were performed eleven hours after the patient's own heroic efforts; recovery followed.

THE DIAGNOSIS OF DISSECTING AORTIC ANEURYSM.

THE excellent monograph of Shennan, published by the Medical Research Council, on dissecting aneurysm of the aorta drew attention to the possible clinical importance of the subject. It is true that in this brochure Shennan accepted only six cases diagnosed during life, but during the last two years seven others have been added to the list; this statement is made by G. E. Osgood, M. F. Gourley and R. L. Baker, who have just described two cases personally observed.[1] Believing that a correct diagnosis should more frequently be made, they have summarized the symptoms and have indicated what features specially help to distinguish between this condition and coronary occlusion, with which it is most commonly confused. The patient is usually a sufferer from hypertension, and the clinical onset of the symptoms is dramatic. Pain is severe and is felt in the chest, but it is usually described as tearing in nature, whereas the character of the pain of a coronary accident is more usually constricting or burning or oppressive. It is important that in the majority of cases there are several predisposing factors which should be readily elicited. One is the existence of arterial hypertension, already noted; another is the incidence of symptoms immediately in relation to excitement or undue exertion, or even the strain of vomiting. The age of the patients ranges between 40 and 70; when the accident occurs in younger persons, it is usually due to some special cause, such as coarctation of the aorta. Syphilis has been much discussed in its relation to dissecting aneurysm, but the evidence points to its being only of secondary importance. In any case this particular catastrophe may certainly occur, and probably most frequently occurs in persons who have not suffered from a luetic infection.

Some of the patients actually complain of a sensation resembling something breaking in the chest. The pain is most intense over the middle or upper part of the sternum, and, while it may radiate to the arms, it more usually extends to the middle of the back or to the abdomen or the lumbar region. The segmental distribution tends to be somewhat higher than that of coronary occlusion, but its radiation is usually wide in range, and exacerbations also occur which tend to show a wandering of the focal point of the pain. The last mentioned symptom is highly significant when observed, and is related to the extension of the effused blood which has escaped through the damaged intima and weakened media of the aorta, and which may either regain the blood channel lower down or strip through the adventitious coat and push its way through adjoining structures. In this way dysphagia may be produced by pressure on the œsophagus. Examination of the patient reveals a condition of great mental apprehension; dyspnœa and cyanosis are common. Shock may reduce the blood pressure, but in some cases a difference between the pulses of the right and left arms is observed. A systolic murmur transmitted downwards may be heard on auscultation over the spine or the lower abdominal blood vessels. An interesting sign is described by the authors; a rise in the icterus index may occur owing to the absorption of the effused blood, though clinical jaundice is not common. Radiographic examination, when possible, may also give valuable information. Of importance is the question of the evidence available by electrocardiography, for, since it is common for coronary disease with myocardial defect to exist in such cases, changes in the *T* wave may be found, thus giving support to a diagnosis of a coronary accident. The electrocardiogram is therefore not of great help in these cases, except to confirm the fact that a cardio-vascular defect exists. This accident is usually fatal; sudden death has occurred within a few minutes in 65% of the cases and within a few days in 10%, but a very few have lived for months or even years.

Sudden severe pain in the upper part of the chest occurring in a hypertensive subject should make us suspect the possibility of this serious condition. Like all other rare clinical states, it will probably be found to be more common as it is more widely recognized, for it should be remembered that it is stated to be found once in every 300 to 500 autopsies.

[1] *Annals of Internal Medicine*, April, 1936.

Abstracts from Current Medical Literature.

SURGERY.

Chronic Subdural Hæmatoma.

LEONARD T. FURLOW (*Archives of Surgery*, April, 1936) gives an historical survey of the known facts concerning subdural hæmatoma. Virchow gave extensive descriptions of the condition in 1857. Trotter in 1914 contributed some notable additions to the knowledge of the subject, whilst an excellent review was presented by Putnam and Harvey Cushing in 1925. Prior to 1925 interest centred in the pathology of the condition rather than in its treatment. Putnam recognized two types. The first is frequently found at autopsy on patients dying of chronic wasting diseases or alcoholism. The second type, which Putnam called the reactive or traumatic, is the one which concerns the surgeon. The author's paper deals with this second type, and he attempts to show that this occurrence is much more frequent than is usually supposed. He contends that if the condition is recognized early, proper treatment offers good prognosis. Symptoms are often vague, and the history of injury can be so slight as to be entirely overlooked. Following upon an injury there is a latent period, extending from a few days to many months, when the patient is free of symptoms. The condition then commences to resemble that accompanying increasing intracranial tension. There is usually a history of headaches, vomiting, visual disturbances, convulsions or mental disturbances. A great variety of symptoms may be manifested in any one patient. The findings may be so confusing as to make ventriculography or trephine openings necessary. Trotter thought that the hæmorrhage originated from the bridging veins running from the cortex into the superior longitudinal sinus. Putnam and Cushing agree with this. Leary examined fifty patients at autopsy and concluded that this explanation was correct. The condition cannot be reproduced experimentally, and this explanation is not universally accepted. In the author's clinic treatment has been through an osteoplastic flap and removal of the liquefied portion of the clot and of as much of the surrounding membrane as is possible; in those patients who are comatose smaller openings may be advisable. The author reports in detail the cases of sixteen patients treated in his clinic. There was definite history of trauma in 80% of them, 88% complained of headache, whilst approximately 70% had choked disks. Localization is frequently impossible by clinical signs alone. The total number of patients operated upon was sixteen, five of whom were already comatose. On operation all of these five died, but only one of the eleven conscious patients succumbed. The three most important points in diagnosis are: (i) history of injury (often slight), (ii) headache, (iii) choked disks. However, the condition may exist in the absence of any or all of these signs.

Radium Needling of Carcinoma of the Breast.

R. BROOKE (*The British Journal of Surgery*, January, 1936) describes a method for the more efficient use of radium needles in the treatment of carcinoma of the breast. The essential feature of the technique is the use of a special frame which carries hollow trocars, in which the radium needles are located during the treatment. The article contains full details and is illustrated.

Encrustation of the Bladder as a Result of Alkaline Cystitis.

H. G. LETCHER AND N. M. MATHESON (*The British Journal of Surgery*, April, 1936) report the case of a pregnant woman, aged twenty-six years, who complained of lower abdominal pain and extreme frequency of micturition for only four days prior to seeking advice. Although found in aged persons with chronic urinary disease, encrustation of the bladder wall is rare in young people. The authors' patient had offensive alkaline urine, and radiological examination showed a clearly defined bladder outline. Cystoscopy was difficult, owing to hæmorrhage and the reduced capacity of the bladder. Acid irrigations were used for twelve days, by which time all encrustation had disappeared, but numerous small areas of ulceration were present in the mucosa. Antiseptic wash-outs were then used, but the deposit recurred. Acetic acid irrigations were continued for another six weeks. Six months later the patient was free from symptoms and all the ulcers had healed. The condition is said to be due to the implantation of the *Bacillus proteus ammoniæ* in a bladder wall which is already inflamed. The encrustations result from the breaking up of urea into carbon dioxide and ammonia with the precipitation of alkaline salts. At the Mayo Clinic the disease was found to be twice as common in females as in males. The symptoms are those of severe chronic cystitis. Cystoscopy renders diagnosis certain. Rendering urine acid by the oral administration of drugs is of little avail. The authors suggest that certain vitamin deficiency factors may be concerned in the causation.

Post-Operative Atelectasis.

F. CHRISTOPHER AND J. N. CHAFFER (*The American Journal of Surgery*, May, 1936) have undertaken a study of post-operative pulmonary complications. According to the authors, William Pasteur was the first to describe atelectasis in 1890. Twenty years later he was the first man to recognize clinically the post-operative variety which had formerly been referred to as ether-pneumonia. Since 1925 the condition has been commonly recognized and is now estimated to form from 20% to 70% of all post-operative pulmonary complications. The mortality of the condition is low, but it may give rise to bronchopneumonia or lobar pneumonia with fatal results; if treatment is delayed, abscess or empyema may be the outcome. The authors have examined the records at Evanston Hospital from 1930 to 1935 and have found reports of only ten cases. Eight occurred following lower abdominal operations. Most of the patients had preliminary medication with atropine. Atropine tends to thicken the secretions, and so may have been a predisposing factor. Most cases have an onset within the first three days of operation. The condition is indicated by a sharp rise in temperature, and a few days later there are shortness of breath, pain in the chest, increased respiration rate and cyanosis. There is dulness to percussion and the respiratory movements are restricted on the affected side. X ray evidence is of great importance in this; unless followed by complications the atelectasis clears by the second or third day and is associated with complete relief from symptoms. Coughing and expectoration of mucus are likely to continue for several days. The authors conclude that clinical diagnosis is frequently difficult. Early X ray examination in post-operative pulmonary complications is of the first importance. Prophylaxis consists in deep breathing exercises for at least one minute of every waking hour. Frequent changing of the patient's position is a very important factor in treatment. Sedatives which diminish the cough reflex should be avoided as far as possible.

Progressive Post-Operative Gangrene of the Skin.

H. T. COX (*The British Journal of Surgery*, January, 1936) states that several instances of progressive post-operative gangrene of the skin have been reported recently. The patient described by him was a male, forty-four years of age, who suffered from an acute perforation of a peptic ulcer. Following operation, the abdominal wall was closed in layers, tension sutures of silkworm gut being used and a small rubber drain being included in the lower end of the wound. On the seventh day there was a profuse discharge from the site of the drain. The whole wound suppurated, and on the fourteenth day an area of spreading gangrene developed on the site of the uppermost tension suture. The area of gangrene extended rapidly and the patient's condition showed general signs of sepsis. Local therapeutics exercised no influence. On the twenty-sixth day the gan-

grenous portion of the wound was widely excised under "Evipan" anæsthesia. The patient refused a skin graft, and three months were required for the wound to close.

Diverticulum of the Duodenum.

H. N. FLETCHER AND L. I. M. CASTLEDEN (*The British Journal of Surgery*, April, 1936) report three instances of duodenal diverticula which they have treated within the last five years with complete relief. Two kinds of diverticula are found in this vicinity, the primary which are usually in the second part of the concave aspect of the duodenum, and the secondary variety due to traction by some neighbouring inflammatory process. They must be regarded as herniæ of the duodenal wall. Their origins are frequently in close relationship to the perforation of the wall by the bile duct or a blood vessel, indicating a localized weakness. The incidence of diverticula is variously computed by investigators. Statistics from the *post mortem* room have sometimes reached as high as 14%, although most authors have stated them to be in the vicinity of 2%. Despite this comparative frequency, clinical symptoms are rare. Inflammation, or even perforation of the sac, has been reported. Most *post mortem* specimens show no evidence of preceding inflammation. In the absence of any clinical picture of such a diverticulum, the authors ask whether it is reasonable to attribute vague symptoms of indigestion to such a pouch when all other causes of such symptoms have been excluded. The cases they present would seem to show that the symptoms were entirely due to these pouches. In all three operations there were no unusual technical difficulties. The first patient was a female, aged sixty-four years, who had severe epigastric pain having no constant relationship to the taking of food. There was much post-prandial flatulence. The pouch was easily visualized by X ray examination and was tender on palpation. At the end of eight years this patient was in good health. The second patient was a female, aged fifty-two years, who complained of intractable recurrent vomiting for twenty years before removal of the diverticulum. The patient is completely well nearly two years after operation. The third patient was a female, aged forty-two years, with a fifteen years' history of pain and gastric flatulence. In this instance operation was followed by improvement, but not complete relief, of the attacks; however, at the operation numerous bands of adhesions were found. In connexion with symptomatology the authors stress the following points: There are attacks of increased upper abdominal pain, but between attacks there is no complete relief from digestive discomfort. The pain is of a deep, gnawing character, and its relationship to food is vague. Continued "belching of wind" with incomplete relief from pain was uniformly noticed. Vomiting may be a prominent symptom. Some tenderness in the region of the pouch was present in all three cases.

Hepatic Trauma.

E. G. KRIEG (*Archives of Surgery*, May, 1936) analyses a series of sixty patients who had undergone hepatic trauma in Detroit; gunshot wounds accounted for 68% of these injuries, while automobile and street accidents were the cause in only 17%. The total mortality for the whole group was 61%, the mortality in the group in which operation was performed being 56%. The most serious prognostic signs were irrationality, irritability, vomiting and jaundice. Extensive hæmorrhage occurred in 80% of the cases, so the author advises the immediate replacement of fluid, particularly as shock and hæmorrhage caused 73% of such patients to die within seventy-two hours. Bile peritonitis was the next most frequent cause of death in this series.

Treatment of Sprains by Interligamentary Injection of "Novocain".

RENÉ LERICHE AND G. ARNULF (*The American Journal of Surgery*, April, 1936) advocate the interligamentary injection of "Novocain" for the treatment of simple sprains when no ligamentary tears or displacements have occurred. A sprain is looked upon as the reflex consequence of trauma and is specifically the result of a distortion of the nervous apparatus present in the articular ligaments. This conception, together with the fact that these ligaments are richly endowed with sensitive corpuscles, provides the rationale for the technique, which consists in the interligamentary injection of from ten to twenty cubic centimetres of a 1% solution of "Novocain".

Peritonitis Following Colonic Surgery.

IN an editorial column of *Surgery, Gynecology and Obstetrics*, April, 1936, C. F. Dixon discusses the occurrence of peritonitis after colonic operations, attributing it to contamination at the time of the surgical procedure or to infection which occurs subsequently because of impairment of the vascular supply of a segment of bowel. Reference is made to the rarity of peritonitis after closure of colonic stomata subsequent to segmental resection of the colon, and to the conjecture that this is due to immunization which has been brought about by the primary operation. In the past seven years more than 2,500 intraperitoneal injections of vaccine have been made at the Mayo Clinic as a preventive measure against peritonitis in cases requiring intestinal operations. In addition to the vaccine, which is given forty-eight to sixty hours before operation, all patients are admitted to hospital three to five days before operation, and during this period the patient is given a high carbohydrate diet and saline cathartics, warm saline irrigations being substituted for the latter if the bowel is obstructed or nearly obstructed. Since the institution of this preoperative plan the mortality from peritonitis following intestinal surgery has decreased by 66%. In this series there has not been one alarming reaction or death that could be attributed to the use of the vaccine, which consisted of killed streptococci and colon bacilli, the usual dose being one cubic centimetre (500,000,000 organisms) in ten cubic centimetres of normal saline solution as a diluent.

Tumours of the Spermatic Cord, Epididymis and Testicular Tunics.

G. J. THOMPSON (*Surgery, Gynecology and Obstetrics*, April, 1936) calls attention to a number of intrascrotal tumours and records the details of forty-one seen at the Mayo Clinic. Of the twenty-six tumours of the spermatic cord, twenty-one were lipomata, one was a fibroma, one a hæmangioma, one a cystadenoma, one a fibrosarcoma, and one a myosarcoma. Thirteen tumours of the epididymis included seven carcinomata, one cystadenoma, four angiomata, and one enlargement of a new type. Of two tumours of the tunica, one was a fibroma and the other a cystadenoma. The prognosis of tumours of these parts is much more favourable than in tumours of the testis, the majority of which are highly malignant. In the treatment of these lesions it is often possible to perform conservative operations because such a number are benign, and castration should not be performed until sections have been examined. If the tumour is found to be malignant, local removal with castration followed by radiation is all that is necessary, as the results of the more radical operations involving retroperitoneal dissection do not justify such extensive procedures.

Lymphogranuloma Inguinale of the Female Urethra.

L. A. GRAY (*Surgery, Gynecology and Obstetrics*, April, 1936) records eleven cases of *lymphogranuloma inguinale* of the female urethra. The syndrome consisted of a chronic urethritis with or without intraurethral ulceration, and this either remained extremely chronic and indolent or proceeded to urethral stricture or ulcerative destruction of the urethra; this ulceration could extend beneath the clitoris and labia or about the introitus and deeply to the sides of the rectum. A wide variety of parenteral and local treatment had no appreciable influence on the disease, the greatest healing occurring in the two patients with the least treatment. It is concluded that cure, as in other virus diseases, probably depends on the development of immunity.

British Medical Association News.

SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association was held at the Medical Society Hall, East Melbourne, on May 6, 1936, DR. WALTER SUMMONS, the President, in the chair.

The President welcomed members from other Branches who were in Melbourne to attend the Seventh Australian Cancer Conference. He also expressed the pleasure of the members of the Victorian Branch at the presence of a number of officials from the Defence Department.

The Civilian Population and Gas.

MR. P. R. WELDON, Secretary of the Chemical Defence Board of the Department of Defence, read a paper entitled: "Defence of the Civilian Population Against Gas" (see page 33).

After thanking the speaker for his excellent and illuminating paper, DR. F. A. MAGUIRE stated that he was speaking, not as a military officer, but as a medical practitioner and a civilian, to brother practitioners who would have to face the question of the treatment of civilians in warfare. He divided the gases into several groups: the choking gases, such as phosgene and chlorine, the crying gases, such as tear gas, which disabled the enemy by completely blocking up the eyes with tears; the sneezing gases, which, taken in at the nose, caused so much pain and sneezing as to make it impossible to put on a gas mask; and the blistering gases of the type of mustard gas. The problem before the members of the medical profession was one of defence in Australia. A recent article in *The Australian Quarterly* pointed out that an enemy could come to Australia only if Britain had lost command of the seas and a hostile navy was given possession of the Pacific. Under those conditions there were three possible plans open to an enemy: a raid with a squadron of cruisers, a blockade by a fleet, or a mass invasion in force with infantry, artillery and all the associated arms of the service. A gas attack might be delivered on any of the capital cities—on Brisbane, on the Sydney-Newcastle area, or on Melbourne. Melbourne, lying inland from the sea as it did, was less vulnerable than either Sydney or Brisbane. Gas could be launched either by cloud gas, by shells or by bombs. It would be impracticable for the enemy to use cloud gas, so they would have to consider the use of shells or bombs. It would be impossible for a fleet operating so far from its home base to put down such a concentration of gas as could be put down by fleets of hostile aeroplanes in London, where they could come in great numbers and return to reload. In Australian cities there could be only a local concentration, which with wind conditions would soon be dispersed. There was no need for alarm or panic among the civilian populace if they understood what to do. It was a solemn duty on the part of State and municipal authorities to provide instruction and facilities for the people to protect themselves against such gas attacks. Mr. Weldon had completely covered problems of the anti-gas treating of buildings along simple lines. The great thing to get into the heads of the people was that the first thing they should do on an alarm being sounded was to go home and stay there. If they did this and kept their heads, there would be no need for alarm and there would be a minimum number of casualties. It was essential that gas protection in the form of masks and proper gas-proof clothing should be given to the following groups of workers: the police, fire brigade, ambulances, hospitals, civilians engaged in such essential services as telephone exchanges, gas-works, water supplies, the electric light plants, and the decontamination squad. Mr. Weldon had covered the necessary protection to be provided for these. There was no need for them to worry about the military part of the community, as that was attended to by the army. It was the duty of every medical practitioner to make himself familiar with the simple precautions and to instruct the people in them, and they should bring as much pressure as they could to bear on the civil authorities. New South Wales had led the way by the formation of a council for the consideration of the protection of the public in gas attacks. Considerable instruction had already been given to the members of the public services which had been mentioned. The main thing to make clear to the civilians was that the safest place was at home, and they should stay there until they were given permission to leave.

DR. JOHN DALE said that he did not think that the medical profession had done its share in preventing the possibility of gas attacks on civilian populations. Admittedly the political leaders of the nations had done their best to protect civilians, but perhaps the medical organizations of the nations might yet exert their influence and make the agreements effective. The lecturer that evening had referred to gases which had been used during the Great War, but it was probable that new gases were ready, the nature of which it would be deemed inexpedient to broadcast. He recognized that the authorities could not be expected to carry out the actual protection of civilians during a gas attack, but he did think that those who knew the properties of the gases to be used should at least prepare directions for the protection of civilians. These directions should be held in readiness for issue when the emergency arose, and should contain the detailed description of the appropriate precautions for the different types of gas. Dr. Dale was quite sure that the municipal authorities would be ready to carry out instructions and exact directions from responsible authorities.

DR. KENNETH SMITH asked Mr. Weldon whether any new and effective gases had been prepared for use in the event of war.

In reply to this question, Mr. Weldon evaded a direct answer, but inferred that all the gases that had been used during the late war had been well known to science and industry for quite a long time.

DR. WALTER SUMMONS, on behalf of the Victorian Branch, expressed appreciation of the excellent way in which subjects had been described by Mr. Weldon. Dr. Summons asked Dr. Downes to move a vote of thanks to Mr. Weldon.

DR. R. M. DOWNES commented on the newspaper report to the effect that the Premier of Victoria had offered the services of the Saint John's Ambulance Association to the civilian population in the event of a gas attack, and yet there was no Government subsidy for the highly valued work of that association under normal conditions. Dr. Downes said that Mr. Weldon was highly trained in the subject of the use and effects of gas, and that his advice had been of great help on certain aspects of military medical equipment. As an example, Dr. Downes referred to the assistance that Mr. Weldon had been able to give to the officials of the Australian Oxygen Company, who had produced in Australia an artificial respirator which was at least the equal of the standard Haldane respirator used in England and was cheaper in Australia; "Carbogen" to stimulate the breathing was supplied as well as oxygen; the outfit was small, portable and fool-proof. Dr. Downes had brought an outfit to the meeting and demonstrated its use. He said that official books had been issued by the Home Office in Great Britain and that, with Red Cross manuals and the Saint John's Ambulance Association publication, which laid down what should be done for the civilian population in the event of a gas attack, the specialists were training themselves and the public in Australia as well as in Great Britain. Dr. Downes considered that it was paradoxical that they should have to prepare against gas when the League of Nations had declared its considered policy and had vetoed the use of gas. It was only a few nights since Dr. Downes had heard a minister of the Commonwealth Government minimize the horrors from aeroplane gas attacks in Australia,

on the grounds that if Australians supported the League of Nations whole-heartedly, all would be well.

Dr. Downes moved a vote of thanks to Mr. Weldon for his address, and the audience carried it with acclamation.

A MEETING of the Victorian Branch of the British Medical Association was held at the Royal Melbourne Hospital on May 20, 1936. The meeting took the form of a series of clinical demonstrations. Part of this report was published in the issue of June 20, 1936.

Massive Blood Transfusion.

DR. IAN WOOD demonstrated the technique of massive blood transfusion by the continuous drip method. The apparatus used was a modification of that described by Marriott and Kekwick. Special reference was made to the treatment of hæmatemesis by this method. In forty-eight hours or less a moribund patient could be dramatically improved and became an excellent "surgical risk" should an operation be necessary.

DR. HILDA GARDNER demonstrated the standard methods of typing blood for blood transfusion, and discussed the extra precautions which were taken if massive transfusion was to be carried out. With this procedure as many as five donors might be necessary, and it was essential that they should be all of the same group as the patient.

Severe Melena due to Polyposis in a Meckel's Diverticulum.

DR. R. P. MCMEEKIN showed a patient who was first admitted to hospital on September 5, 1935, with a history of vague abdominal colicky pain on the previous day. The following evening she had another slight pain and collapsed on going to the latrine, where she was found by her parents, who noticed that she had passed a lot of moderately bright blood in her motion.

On her admission to hospital the patient's general condition was satisfactory, and physical examination did not reveal any abnormality. The day after her admission, the pulse rose to 140 per minute, and the systolic blood pressure fell to 90 millimetres of mercury, and she was given a transfusion of a pint of blood. The next day a further transfusion was necessary, following which the patient made an uneventful recovery. The blood examination on admission had shown the hæmoglobin value to be 37% (Sahli); the erythrocytes numbered 2,450,000 per cubic millimetre, with a bleeding time of four minutes and thirty seconds (as compared with the normal bleeding time of two and one-half to three and one-half minutes); the coagulation time was two minutes, the normal time being two to three minutes; there was a normal clot retraction. A differential white count showed a shift to the left of the granular series with a monocytosis, and other investigations carried out included a barium enema and sigmoidoscopy, each failing to reveal any abnormality. Examination with a proctoscope had revealed a few primary piles, but there was no evidence of a hæmorrhage. When the patient was discharged on October 19, 1935, a provisional diagnosis of polyposis of the colon was made.

On March 3, 1936, about five months later, the patient was readmitted to hospital, following a second severe melena. On this occasion she gave a history of vague upper abdominal pain, travelling down the left side, three to four days before admission; and on admission she developed a sharp colicky pain, followed some hours later by the passage of dark fluid blood *per rectum* on two occasions, but her condition was found to be satisfactory and physical examination did not reveal any abnormalities. The patient, however, continued to pass blood *per rectum*, and on March 4, 1936, the hæmoglobin value was estimated to be only 28% (Sahli); the next day she was given a transfusion of one pint of blood, and from then onwards she made an uneventful recovery. A complete blood examination, including a determination of the bleeding time and the coagulation time, again showed no abnormality, and a further barium enema revealed no lesion of the colon. At this time the patient was thought to be suffering from Henoch's purpura, and skin tests for allergic tendency were carried out; these revealed some sensitivity to kapok, house dust and orris root, but there was no definite reaction in any case. It was then considered that the hæmorrhage might have been due to ulceration of some gastric mucosa in a Meckel's diverticulum; and on April 28, 1936, laparotomy was performed and a small Meckel's diverticulum was found, the bowel below this level containing dark material, apparently old blood, while the bowel above it was empty. No other bowel lesions were found, and the diverticulum was resected. On section, the diverticulum was found to contain an adenomatous polypus, but no gastric mucosa was recognized.

Syphilis of the Lung.

DR. GEOFFREY A. PENINGTON'S first case was an example of syphilis of the lung. The patient was a male, seventy years of age, who had been under observation for seven years, and who had first attended with a history of cough for some months associated with clear or slightly coloured sputum and slight dyspnœa on exertion. He had at that time signs of fibrosis over the right upper lobe with scattered râles and rhonchi, and was considered to be in all probability suffering from chronic fibroid tuberculosis. His sputum was examined on six occasions for tubercle bacilli with negative results and, as a result of treatment with simple expectorants, his condition improved rapidly. During the succeeding two and a half years he attended sporadically because of colds, recurrences of cough and sputum, but was not seen by Dr. Penington until November, 1932, when he was definitely worse, with increased cough and sputum, and more extensive signs of fibrosis, especially in the apex of the right axilla. The serum was then for the first time submitted to the Wassermann test and twelve minimal hæmolytic doses of complement were fixed. Radiological examination revealed an area of consolidation occupying the base of the right upper lobe and the apex of the right lower lobe, the extreme right apex and left lung being apparently clear. Antisyphilitic treatment with iodide and *Hydrargyrum cum Creta* was instituted, but the patient's condition became rapidly worse. He looked extremely ill and lost weight; he complained of aches and pains all over, the pains in the chest being the most severe; he was harassed by coughing, especially at night, and was expectorating an increased amount of frothy sputum, at times blood-stained. The extent of the lesion appeared to increase during this time; scattered râles were audible over the right side of the chest and the patient became very enfeebled physically and was mentally abnormal. In January, 1933, he was admitted to the ward with a provisional diagnosis of pulmonary carcinoma.

Management of the patient was extremely difficult with his altered mental condition, and he went to his own home after a short period in the hospital, although the clinical evidence indicated a progressive lesion and radiological examination disclosed a tremendous increase in the area of consolidation with involvement of the whole right upper and middle lobes and the upper portion of the right lower lobe. Fortunately, the patient persevered with mercurial inunctions and potassium iodide, and made a steadily progressive recovery from that time. The preliminary medication was followed by carefully regulated doses of "Novarsenobillon" and bismuth injections until intensive treatment was given without any deleterious reaction.

Clinical and radiological examination had confirmed the symptomatic improvement and the patient reported that he was in reasonably good health and able to undertake moderately strenuous exertion without discomfort. The sputum had decreased to a maximum of about one ounce per week. The physical signs at the time of the meeting were very definite, there being flattening, decreased movement, dulness and bronchial breathing over the upper lobe on the right side; tympany and amphoric breathing were present at the apex of the right axilla, but it was considered that this was attributable to the extensive fibrosis and coincident displacement of the trachea and bronchi to the right side. The radiograms

exhibited clearly demonstrated the various changes and the satisfactory condition achieved.

Dr. Penington pointed out that the condition was a rare one, but probably occurred more frequently than was realized. In the adult, similation of pulmonary tuberculosis was the most frequent clinical manifestation and this condition could be excluded only by frequent examination of the sputum for the tubercle bacillus. Coexistence of the two conditions merely added to the severity of the illness and tuberculosis was then the dominant feature. On clinical examination the only other evidence of visceral syphilis in the patient shown was the loss of sensation in the left testis; and the evidence on which Dr. Penington claimed accuracy of diagnosis was (*a*) that tubercle bacilli had not been found in the sputum on repeated examinations; (*b*) that there had been an excellent response to anti-syphilitic treatment; (*c*) that the left testis was insensitive to pressure; (*d*) that the serum reacted to the Wassermann test; (*e*) that there was a history of a penile sore thirty-seven years earlier, for which treatment had lasted only a few months.

Chronic Leuchæmic Myelosis.

The second patient presented by Dr. Penington was a male, aged twenty-six years, who was suffering from chronic leuchæmic myelosis. The patient had reported because of epigastric pain which had been present for one week and which he considered to be due to indigestion. He had had a slightly sore throat, had been feverish during that time, and had been unable to continue his work and had noticed fatigue, lassitude, and abdominal swelling for six months and progressive increasing dyspnœa on exertion for three months. He was pale, his temperature was 40° C. (104° F.) and the abdomen was distended. Slight ascites appeared to be present, but the chief cause of the distension was an enormous spleen occupying almost the whole of the left side of the abdomen; the splenic notch was easily felt, but the surface was slightly irregular; the liver was enlarged to a distance of 5·0 centimetres (two inches) below the costal margin. The lymph glands in the right axilla were slightly enlarged and examination of the blood revealed the typical picture of chronic leuchæmic myelosis. The erythrocytes numbered 3,000,000 per cubic millimetre, the leucocytes 187,000 per cubic millimetre; the hæmoglobin value was 37% (17 grammes standard), and the colour index was 0·59. The differential counting of the leucocytes revealed a typical deviation from normal, save that the percentage of monocytes and lymphocytes was rather low; the neutrophile polymorphonuclear cells were 12·5%, myelocytes 0·5%, eosinophile polymorphonuclear cells 3·0%, basophile polymorphonuclear cells 1·0%, old metamyelocytes 29·5% and young metamyelocytes 21·0%, myelocytes 21·0%, myeloblasts 8·0%, small lymphocytes 2·0%, and monocytes nil. Deep radiotherapy was commenced immediately, and in two weeks the leucocytes had decreased to 39,000 per cubic millimetre, the erythrocytes numbered 2,900,000 per cubic millimetre and the hæmoglobin value rose to 46%, presumably as a result of large doses of iron. The temperature had gradually fallen to lower levels, but was not then normal. Blood films taken from the patient were exhibited for examination.

In discussing the condition Dr. Penington said that the only satisfactory form of treatment was irradiation by deep radiotherapy or radium, the most satisfactory results being obtained by irradiating the spleen, but necessarily this was only treating part of the condition and the myeloid hyperplasia in the bone marrow was unaffected. The effect of therapy was considered by Dr. Penington to be a temporary one requiring repeated observation and treatments. It relieved the patient, enabled him to live a more normal life, and apparently prolonged life, in some cases very considerably. The prognosis as regards duration of life depended largely on the response to treatment, but also on the degree of chronicity of the condition. Dr. Penington knew of one patient still under treatment after seven years. Dr. Penington did not advise benzol because the effect on the erythropoietic system was noticeable, and aplastic anæmia could easily be precipitated, even when careful blood examinations were made repeatedly.

Polycythæmia.

Dr. Penington also presented a patient, a male, sixty-three years of age, who was suffering from polycythæmia. Some doubt remained as to whether it was justifiable to consider the condition as *polycythæmia vera* or as secondary polycythæmia. The patient had complained of dyspnœa on exertion; he had worked as a quarryman until about three years earlier and for two and a half years he had been very ill with dyspnœa, œdema of the lower limbs, and swelling of the abdomen, and had been "tapped" on both sides, presumably because of pleural effusions. After recovery from this illness he had been able to take very moderate exercise, although suffering from attacks of giddiness. More recently, however, he had noticed increasing dyspnœa and swelling of the feet and ankles; and for six months he had had occasional epistaxis and a feeling of fullness in the head. His appearance was that of polycythæmia; he had a ruddy cyanosis with marbling of the skin of the face, the former being most apparent in the lips and ears; the mucous membrane of the mouth was dusky and slightly pigmented, the skin becoming pigmented when rendered anæmic. The retinal veins were enormously enlarged and the retinæ dark, and the veins of the neck were grossly distended, the arteries were thickened, and the blood pressure readings, systolic and diastolic, were 150 and 100 millimetres of mercury respectively. The patient's heart was enormously enlarged, the apex beat being in the mid-axillary line, 20·0 cubic centimetres (eight inches) from the mid-line in the seventh intercostal space, and cardiac dulness extended 5·0 centimetres (two inches) to the right of the mid-line. Beyond a fairly soft systolic bruit at the region of the apex no abnormality could be detected on auscultation. The liver was palpable three fingers' breadth below the right costal margin and the spleen was enlarged, long and narrow, lying in the left loin but freely movable to beyond the mid-line; there was œdema of the ankles and very slight clubbing of the fingers was considered to be present. The blood did not react to the Wassermann test and renal function was within normal limits. On examination of the blood the erythrocytes numbered 10,000,000 per cubic millimetre, the hæmoglobin value was estimated to be 132% (17 grammes standard) and the colour index to be 0·64 with the leucocytes 9,700 per cubic millimetre. Films revealed some anisocytosis and slight pallor of the erythrocytes and a relative and absolute neutrophilia. With rest in bed the patient felt better and the urinary output increased. Thirty ounces of blood were removed by venesection without demonstrable effect on the red cell count and hæmoglobin, but with subjective benefit to the patient. Although, in view of the gross cardiac enlargement, some doubt existed regarding the cause of the polycythæmia, it was considered advisable to attempt to reduce the erythrocyte count. Phenylhydrazine hydrochloride was administered, the dose being 0·09 gramme (one and a half grains), in capsules, thrice daily for one week, followed by 0·09 gramme, twice daily for one week, the hæmoglobin and erythrocyte count being estimated every second or third day. This treatment appeared to be having a salutary effect, but Dr. Penington pointed out that unfortunately for the purpose of demonstration, on the day of the meeting, fourteen days after the commencement of treatment, the laboratory report disclosed that the hæmoglobin value was 110% and the cell counts 10,830,000 and 17,000 per cubic millimetre for erythrocytes and leucocytes respectively. The possibility of Ayerza's disease was discussed, and it was thought that the presence of a congenital cardiac lesion could not be entirely dismissed, although it was difficult to conceive of a man with such a lesion continuing to work as a quarryman, doing extremely heavy work without distress, till the age of sixty years. However, the electrocardiogram did show slight right ventricular preponderance. Dr. Penington considered that the diagnosis had to remain *sub judice*, but that it was still desirable to endeavour to

decrease the degree of polycythæmia. He urged that the initial course of phenylhydrazine should on no account exceed five grammes, and preferably should not exceed three grammes, because of the cumulative action of the drug and the risk of producing some anæmia or even aplasia. Dr. Penington advised that a period of at least one week should intervene before treatment was resumed, and if the patient was not under observation in hospital, smaller doses were advised and a slower response was aimed at. He stated that frequent blood examinations were absolutely essential. He had found that one patient did not respond to treatment with potassium arsenite, even when it was pushed to the extent of producing arsenical poisoning; and in another instance an initial response produced by phenylhydrazine had been maintained by means of the other drug, and the patient preferred the arsenic. The risk of thrombosis was also discussed at the meeting.

Acromegaly and Diabetes Mellitus.

DR. T. A. F. HEALE showed three patients with acromegaly and *diabetes mellitus*.

The first patient, a male, fifty-three years of age, was referred to the diabetic clinic on August 29, 1933. Sugar had been found in the urine six months previously, when he complained of thirst and polyuria, and on examination it was found that he furnished a typical example of acromegaly. The urine contained a large amount of sugar, but no ketone bodies, and the fasting blood sugar was 0·21%; following the administration of fifty grammes of glucose, the blood sugar rose to a maximum of 0·29% at the end of two hours. The skiagrams revealed a greatly enlarged *sella turcica*, with great increase in depth and no apparent erosion of the floor. The posterior clinoid processes were thinned, but their tips were still well defined and curved forwards. Vision was normal and there was no defect in the visual fields. The basal metabolic rate was +41%. The acromegaly was of many years' standing; a photograph, taken in 1912, showed quite definite signs; yet during all these years the patient had not been inconvenienced by this malady, and until recently he had worked at his trade as a blacksmith. The diabetes had been satisfactorily controlled on a diet of carbohydrate 154 grammes, protein 70 grammes, fat 75 grammes (calories, 1,571), with insulin 28 units daily (16 units before breakfast and 12 units before the evening meal). Since 1933 the patient had attended the diabetic clinic regularly and he had maintained good health; repeated examinations of the visual fields had given normal results, and the diabetes had remained well controlled on the above diet and insulin. The fasting blood sugar was 0·12%.

The second patient shown by Dr. Heale was a female, fifty-four years of age, who had been admitted to the Royal Melbourne Hospital on January 5, 1935, with a fracture of the left thigh caused in a motor car accident and in addition she presented the typical appearance of acromegaly. The urine contained a large amount of sugar, but no ketone bodies, and the fasting blood sugar was 0·24%. X ray examination showed the *sella turcica* to be greatly increased in depth, with some thickening of the posterior clinoid processes. The basal metabolic rate was +3%. Sixteen years earlier the patient had first noticed that her hands and feet were enlarging, and after six years the diagnosis of acromegaly had been made, though she had been singularly little troubled by the acromegaly. Eight years ago sugar was found in the urine and the patient was placed on a diabetic diet; she had neglected the diet for about a year prior to her admission to hospital and had had a return of diabetic symptoms: thirst, polyuria, loss of weight and strength. The diabetes was satisfactorily controlled on a diet of carbohydrate 150 grammes, protein 70 grammes, fat 90 grammes (calories, 1,690), with insulin 24 units daily (14 units before breakfast and 10 units before the evening meal); the fractured thigh united with a good function as a result. The patient had attended the diabetic clinic since her discharge from hospital and latterly had complained of failing vision; examination of the fields of vision showed that only a small portion of the nasal field in each eye remained. The diabetes had been easily controlled with the above diet and insulin, and the fasting blood sugar was 0·16%.

The next patient to be shown by Dr. Heale was a male, forty-seven years of age, who was admitted to another hospital on February 26, 1936, with acromegaly and *diabetes mellitus*. The duration of the acromegaly was not known, but was at least ten years. The patient had had typical diabetic symptoms, such as thirst, polyuria, loss of weight and strength; the symptoms had developed in July, 1935, and on the patient's admission to hospital the urine contained a large amount of sugar and a trace of diacetic acid. The fasting blood sugar was 0·20%. The patient received treatment with a low carbohydrate-high fat diet and insulin, but his diabetes was not easily controlled, and on May 1, 1936, he was admitted to the Royal Melbourne Hospital for further investigation. The urine showed sugar after breakfast and after luncheon, and occasionally after the evening meal, but was free from sugar in the morning. The fasting blood sugar was 0·09%. The patient was transferred to a higher carbohydrate and lower fat diet, on which he felt much better, and he was able to be discharged from hospital on May 18, 1936, on a diet of carbohydrate 218 grammes, protein 81 grammes, fat 107 grammes (calories, 2,159), with insulin 48 units daily (30 units before the evening meal). The urine occasionally showed a small amount of sugar after breakfast, but was free from sugar for the rest of the day, and the fasting blood sugar was 0·09%, while the blood sugar in the late forenoon, afternoon and evening did not rise above 0·12%; and the patient had gained weight and felt much better. The skiagram showed a very large *sella turcica*, spherical in shape, the enlargement being mainly downwards. The clinoid processes were intact and rather large. The fields of vision were normal and the patient did not complain of any symptoms which could be attributed to his pituitary tumour. Dr. Heale said that adenoma of the anterior lobe of the pituitary, composed of eosinophilic cells, was demonstrated in almost all acromegalic patients. In the rare cases in which no tumour was found, hyperplasia of the eosinophilic cells was present; glycosuria was common in acromegaly; in one hundred cases of acromegaly Cushing found glycosuria in 25% and *diabetes mellitus* in 12%. The glycosuria was often transitory, disappearing and reappearing according to the activity of the pituitary, and therefore it was highly probable that the above figures would be greatly increased if the acromegalic patients were observed carefully for longer periods. The severity of the diabetes also fluctuated, though at any given time it did not differ essentially from that of ordinary diabetes. The exact mechanism of production of the glycosuria and of the diabetes was not entirely clear; but it was reasonable to suppose that the secretion of the eosinopilic cells of the pituitary interfered with the production or the action of insulin. Glycosuria was distinctly uncommon with other types of pituitary tumour. Dr. Heale said that revival of the pituitary gland in depancreatized animals caused the diabetes to become much milder; he did not think, however, that operation on the patients under discussion was indicated on this ground alone. Interference with vision was the important indication for operation; so far only the second patient showed this defect, and she was to be admitted to hospital and operated on a an early date. The other two patients were kept under observation and had their fields of vision tested from time to time. Eosinophilic adenomata were sensitive to X ray irradiation and good results were reported in a number of cases; but such treatment was not entirely free from danger. The swelling and necrosis induced in the tumour by the irradiation sometimes initiated pressure on the chiasma or led to an increase of pressure, as shown by rapidly failing vision, and in such circumstances prompt action was needed. X ray radiation was definitely contraindicated in the second patient, and because the other two patients were so little inconvenienced by the tumour Dr. Heale did not advise such treatment.

Transplantation of Ureters for Intractable Cystitis.

DR. J. THOMSON TAIT showed two patients who had suffered for years from intractable cystitis which had not cleared after cystostomy and permanent drainage of the bladder.

One patient, a male, forty-two years of age, had had several operations for stricture of the urethra, the last being an excision of the stricture and perineal fistulæ performed by Dr. Tait in 1928. Although the urethra remained patent so that sounds to Number 20 French could be passed to the bladder, severe cystitis remained, and in 1932 the bladder was opened on account of persistent hæmaturia and two-hourly frequency of micturition. The mucous membrane was treated by coagulation diathermy and the bladder was drained. The symptoms, however, persisted for the next three years, in spite of continuous suprapubic drainage, and in July, 1935, the patient complained of intense strangury, hypogastric and loin pain, shivers and sweats, and there was much pus and blood in the urine. Intravenous pyelography showed normal renal pelves and ureters, and ureteral transplantation was decided upon. The left ureter was first transplanted into the sigmoid colon, and four weeks later the right ureter was similarly dealt with. During convalescence after each operation the patient had noticed severe pain in the loin, corresponding to the side on which the ureter had been transplanted. This subsided in from twenty-four to forty-eight hours on each occasion and had not been present again. It had been probably due to temporary swelling of the end of the transplanted ureter, and Dr. Tait put this forward as a reason for doing the operation in two stages. The patient, at the time of the meeting, was very well and he had full control of the urine in the bowel for from six to eight hours, the only discomfort being the disturbance when wind collected in the rectum. In an intravenous pyelogram taken at the date of the meeting both kidneys were secreting normally without dilatation; and no further operation had been done on the urinary bladder, which was then a small sinus with very slight discharge.

Dr. Tait also showed a male patient, sixty-two years of age, who had a history of periurethral abscess and perineal fistulæ, for which suprapubic cystostomy had been done five years previously. The patient had worn a suprapubic tube for that time and was able to go about, but the bladder had remained infected and there had been periods of bleeding and stone formation. The operation of ureteral transplantation in his case had been decided against on account of the result of intravenous pyelography, the films of which were shown. There was great bilateral dilatation of the renal pelves and ureters, the latter being enormously widened and tortuous.

Specimens from a Case of Ulcerative Endocarditis.

DR. S. O. COWEN discussed the history and showed specimens from a patient, a girl, twenty years of age, who was admitted into hospital on April 20. She complained of a slight pain in her right side, of "pleural" type, with a duration of three weeks. Four days prior to her admission this pain had become very severe, and she had had a cough for a few days, but there was practically no sputum. The patient's history revealed that there had been two attacks of gonorrhœa some time previously. No abnormal physical signs of any consequence were found at the time of her admission to hospital; the cardiac examination revealed no abnormality and the white blood cell count was 19,000 per cubic millimetre. Seven days after her admission a loud blowing aortic diastolic bruit developed. Two days later apical presystolic and diastolic bruits were noted, and after nine days these were still audible, but at that time the aortic sounds became normal again.

The patient died on May 12 and throughout her illness she displayed extraordinary euphoria. The blood culture was thrice negative, but the result of the gonococcal fixation test was strongly positive, and no embolic phenomena were noted at any period of the illness. The specimens showed an extensive ulcerative lesion of the aortic valve, but the mitral valve was normal. There was a recent tuberculous lesion with miliary sowing in the upper lobe of the right lung.

Hypernephroma of the Left Kidney with Hydronephrosis.

Dr. Cowen also showed a male patient, fifty-six years of age, who, five years earlier, had had profuse hæmaturia, which had continued for fourteen days and recurred at intervals during twelve months. He had been free from bleeding for the next twelve months, but at the end of that time it recurred for fourteen days and thereafter no hæmaturia was noticed until six weeks before admission. During the earlier part of the patient's illness there had been some retention of urine, accompanied by discomfort, apparently due to blockages of the urethra by clots; and three weeks before his admission to hospital he had for the first time pain of moderate severity in the region of the left kidney. During the two months before his admission the patient lost 9·5 kilograms (one and a half stone) in weight. On examination a large, freely movable tumour was noted in the left lumbar region; it was roughly the shape of a kidney and its surface was somewhat lumpy, and the urine was dark red in colour. The report on the pyelogram of the left kidney was to the effect that the left ureter was displaced towards the mid-line. The pelvis, which was high, held eighty cubic centimetres of iodide solution, and the portion of the kidney filled with iodide showed definite hydronephrotic change, but this portion represented only about one-third of the renal shadow shown, the lower two-thirds being considerably wider than the area filled. The conclusion was that the condition was probably a large cyst or neoplasm of the lower pole of the kidney. It was considered that the only condition which would explain all the observed facts was a combination of hydronephrosis and a renal neoplasm. At an operation performed on April 15, 1936, Dr. Hailes removed the specimen shown, which weighed forty-two ounces.

Hydatid Disease of the Spine.

Another patient shown by Dr. Cowen was a male, thirty-three years of age, who had been admitted to hospital on March 6, 1935. Three months before admission to hospital he had had a slight pain in the middle of the back, and one month later this pain radiated up and down the spine and was worse than before; any movement of the spine increased its severity. Three weeks before admission a feeling of numbness developed below the umbilicus, with a sudden weakness of both lower limbs, so that the patient could not walk without a stick, but the last-mentioned symptom had shown slight improvement during the week prior to his admission to hospital. On examination the power in the muscles of the lower extremities was found to be moderately good; the gait was spastic and he dragged his feet; the left plantar reflex yielded the extensor response and the right reflex was equivocal; the left superficial abdominal reflex was absent; the knee jerks were hyperactive and bilateral ankle clonus was present. There was no sensory loss, but a band of hyperæsthesia was present at the level of the fourth thoracic vertebra, and the fundi were found to be normal. By lumbar puncture it was established that the cerebro-spinal fluid was under decreased pressure; the globulin content was found by the Pandy and Nonne Apelt tests to be increased; there were thirty-five lymphocytes and one large mononuclear cell per cubic millimetre; and the colloidal gold test gave no reaction. The Wassermann test of the blood and cerebro-spinal fluid gave no reaction, even after a provocative injection of "Novarsenobillon" had been given. On March 25, 1935, a *cisterna magna* puncture revealed the cerebro-spinal fluid to be under normal pressure, and there were no mononuclear cells nor was excess of globulin found. One week later, descending lipiodol was held up at the level of the first thoracic vertebra and immediately afterwards the patient complained of severe root pains in the upper thoracic region. The Casoni test, performed on April 8, 1935, gave a strongly positive reaction, and on April 5, 1935, ascending lipiodol was completely blocked

at the twelfth thoracic vertebra. The hydatid complement fixation test on the cerebro-spinal fluid gave no reaction, but was not performed on the blood. At operation on April 12, 1935, laminæ from the sixth cervical and third thoracic vertebræ were removed; but later, during an operation, the fourth and fifth cervical and the fourth and fifth thoracic vertebral laminæ were also removed; the patient had an urticarial eruption after the operation, which lasted twenty-four hours.

Laminectomy was performed thirteen months ago for spinal hydatid disease, and the patient was discharged from hospital, walking with difficulty with a stick. His condition improved and he was able to discard the stick and return to work as an insurance agent three months later. The patient was quite well for about seven months, when he first noticed, three months ago, pains round the chest like a constricting band, also tingling and numbness in the ring and little fingers of the right hand and on the ulnar side of the forearm, also some loss of power in the right hand, though he was still able to walk well. On examination it was found that there was diminished sensibility over the ulnar distribution of the forearm and half of the ring finger and left finger of the right hand; apposition of thumb and little finger was poor, and wasting of all interossei was noted. There was also some loss of power in the right hand, and a band of anæsthesia was present at the level of the seventh thoracic vertebra posteriorly on both sides. The sensation on the chest wall anteriorly was normal and there was an implantation cyst in the tree of the scar.

Surgical Treatment of Intracranial and Spinal Lesions.

DR. A. E. COATES showed a series of patients illustrating the surgical treatment of intracranial and spinal lesions.

The first patient was a female, forty-eight years of age, who had had visual difficulty for eighteen months. Examination revealed a bitemporal hemianopia, and a radiogram of the *sella turcica* showed complete erosion of the posterior clinoid processes. At operation under local anæsthesia, through a transfrontal approach, a tumour of the pituitary gland was found bulging upwards and stretching the left optic nerve. The tumour was incised with the diathermy needle and the contents, which were soft and gelatinous, were sucked out with the aspirator. The patient's recovery was uneventful and the vision improved somewhat during the six weeks after the operation.

Dr. Coates also showed a female patient, thirty years of age, who for eighteen months prior to admission had suffered from progressive deafness in the left ear and headaches. Examination revealed complete deafness of the left ear (nerve type), paresis of the left seventh nerve, paralysis of the left sixth nerve, and partial anæsthesia of the left side of the face. Papillœdema of gross degree was present in both eyes, and radiographic films showed an enlargement of the left internal acoustic meatus; nystagmus, rotating, horizontal and vertical, was noted. A suboccipital decompression operation was performed under general anæsthesia. The left lateral ventricle was tapped, but the tension was so great that the left hemisphere of the cerebellum had to be partially removed in order to display the tumour of the right nerve; the capsule was incised and the contents of the neurofibroma were scooped out. Examination of the tumour showed it to be a neurofibrosarcoma. For four months the patient had progressed and at the time of the meeting had no signs of cerebellar disturbance, except a little vertigo on standing.

Dr. Coates presented also a female patient, forty-two years of age, who had been suffering from blurring of vision for three years. Homonymous hemianopia and gross papillœdema were observed on examination. Severe headaches over the eyebrows and vomiting had occurred frequently. At operation nine months later, under general anæsthesia, a large meningioma arising from the upper surface of the *tentorium cerebelli*, in association with the transverse sinus, was removed. The tumour was 5·0 by 7·5 centimetres (two by three inches) in size, and section showed an active meningioma. The patient's recovery had been complete as far as the headaches and general comfort were concerned. The visual fields had improved and she could now do her work in comfort and read quite well.

Another patient shown by Dr. Coates was a male, fifty-four years of age, who had had epileptic fits and flashes of light before the eyes for four years. Examination revealed a left quadrantic hemianopia (lower quadrant). At operation three months earlier, under local anæsthesia, a small meningioma was removed from the right side of the *falx cerebri*, in the occipital area. A portion of the sagittal sinus was removed with the tumour, muscle being used to arrest bleeding from the sinuses. Since the operation the patient had had no more fits and his vision was improving.

Dr. Coates also showed a patient who had had a calcified tumour of the left frontal lobe. This patient had had the left frontal lobe of the cerebrum amputated eighteen months earlier for a tumour causing headache, vomiting and papillœdema. The patient had been shown at the corresponding Branch meeting a year previously, and she had remained well and did her housework in comfort. She had had three epileptiform seizures during the year, presumably due to scarring in the region of the tumour removed. No headaches or other signs of tumour had recurred, and she was very satisfied with her condition.

Dr. Coates also showed a case of angioma of the spinal cord in a male, thirty years of age, who had had for seven months progressive spacticity in the lower limbs and bilateral extensor plantar reflexes, precipitancy of micturition and of defæcation. Patchy anæsthesia of the lower limbs up to the ninth thoracic segment was demonstrable. At operation a laminectomy from the seventh thoracic to the twelfth thoracic vertebræ was performed. A tortuous vessel on the left side of the spine in the muscles was seen on exposure of the dura; on opening the dura a large tortuous vessel, continuous with the vessel outside the spine via the intravertebral foramen, was seen on the dorsum of the cord. The condition was regarded as an aberration in segmental blood supply comparable with the irregular masses of arterio-venous cords sometimes seen in the limbs. The dura was closed and the patient was returned to bed. Deep radiotherapy was employed, and within two months all symptoms had disappeared and the patient was perfectly well at the time of the meeting.

Ophthalmological Demonstration.

DR. Z. SCHWARTZ showed a number of patients with ophthalmological conditions, which included primary optic atrophy in a tabetic patient, progressing in spite of treatment by induced malaria and anti-specific treatment; primary optic atrophy following a fractured base of the skull; secondary optic atrophy following neuritis of the optic nerve-head and a retrobulbar neuritis. The last-mentioned patient had loss of the lower nasal quadrant of the field of vision and a central scotoma, for which no other cause was found except that the patient suffered from diabetes. Dr. Schwartz also showed an example of gross arteriosclerotic retinitis in a diabetic patient, though there was no evidence of characteristic diabetic retinitis. He also showed patients with diabetic retinitis, arteriosclerosis of the retinal vessels, *retinitis pigmentosa*, and an example of subhyaloid retinal hæmorrhage.

Spondylitis Rhizomélique.

DR. T. FRANK showed a male, twenty-four years of age, a sleeper-hewer by trade, who was first seen in the out-patient department on November 8, 1935. At that time he stated that he had been perfectly well until two years previously, but had then developed pains in the left hip joint region, which he regarded as the result of lifting heavy weights. Shortly afterwards, pains had occurred in the back, which were made worse by movement and disappeared with rest; and for the past twelve months he had had difficulty in straightening his back and had also had "cramp-like" pains around his heart; apart from the above disability his health had been good. There was nothing of note in the patient's past history except the fact that all his teeth had been removed two and a half years earlier. Examina-

tion showed a pale young man, who moved very slowly and with great difficulty from one position to another. There appeared to be gross limitation of chest movements on deep breathing, and the spine showed a dorsal kyphosis and rigidity of the lumbar vertebræ. The movements of flexion and extension were grossly limited and caused much pain. In addition, there was tenderness on pressure over the lower thoracic lumbar vertebræ and also over the sacro-iliac joints; the other joints showed full range of movements and were quite normal. A radiogram taken of his whole spine on November 19, 1935, showed well-defined arthritic changes in the left sacro-iliac joint and less well-defined changes on the right side. The Wassermann and gonococcal complement fixation tests gave no reaction. The blood sedimentation rate on November 11, 1935, was shown to be under eighteen at the end of one hour (a slightly increased rate). Radiographic examination of the sinuses and chest revealed no abnormality. Green streptococci were recovered by culture from the urine and from the prostatic secretion; on the other hand, hæmolytic streptococci were obtained from the fæces and also from a tonsillar swab. Treatment had consisted in tonsillectomy and administration of a vaccine prepared from his fæces and also from a tonsillar smear; but there had not been the slightest response to treatment. This case exemplified the clinical picture of *spondylitis rhizomélique* or *ankylopoietica*. There was involvement of both sacro-iliac joints, as shown on radiographic examination, and in addition there was gross restriction of movement in the spine and in the thoracic cage, although no radiological changes in the spine were obvious.

Dr. Frank said that these cases were often mistaken for muscular rheumatism, lumbago, neuritis or sciatica. It had been definitely shown by both British and Continental radiologists that with these vague backaches and pains in the buttocks and thighs (the so-called prespondylitic history) radiological examination would often disclose changes in the sacro-iliac joint. At the outset there was blurring of the joint space; also there was destruction of cartilage, and slight sclerosis became evident in the peri-articular bone of the sacrum and ilium; finally there was destruction of the joint with complete disappearance of the joint between the sacrum and the ilium. These changes in sacro-iliac joints occurred in all cases of *spondylitis rhizomélique*. Involvement of the lumbar spine followed, which caused stiffness and finally fixation; later on, after a variable period, the thoracic and cervical spines might be involved. This was due to inflammation occurring in the anterior and posterior spinal ligaments, *ligamenta flava*, and the costo-transverse and costo-vertebral ligaments. Inflammation in the last-mentioned site resulted in the fixity of the thorax on respiration. A radiogram might show calcification and ossification of these ligaments, producing a rigid spine, and later on, when an associated decalcification of the spine occurred, the typical "bamboo spine" would result.

This joint lesion was usually regarded as being infective in origin and akin to rheumatoid arthritis, and its treatment was conducted on the same lines. Attention in the early days should be paid to thoracic breathing exercises and also to movements of the spine. Recently, parathyreoidectomy had been advocated for this type of case, its object being to prevent the decalcification of the vertebræ and the subsequent deposition of the calcium in the ligaments; whether it was of definite therapeutic value still remained to be seen.

Congenital Nystagmus.

Dr. Frank also showed a patient, J.L., nineteen years of age, who was first seen in the out-patient department on March 16, 1936, with the history that his eyesight had been deteriorating recently and that he was extremely nervous and irritable; otherwise his general health had been good. Examination revealed no abnormality, except for a slight tremor of his eye muscles and a coarse tremor of his hands; in addition there was a definite nystagmus of both eyes, of the rapid type, in all directions. The patient stated that this had been present from infancy. Examination of the patient's eyes disclosed no abnormalities such as corneal scarring or congenital cataracts; the patient's vision was impaired, the visual acuity being $^6/_{60}$ in each eye. A diagnosis of congenital nystagmus was made; there was found to be no familial history of this anomaly.

With reference to ætiology, Nettleship had suggested that the imperfect sight (as seen in some of these cases) and associated with it the nystagmus were caused by deficiency of pigment in the retinal epithelium. This deficiency might affect only a part of the retina, namely the *fovea centralis*, and not be recognizable with certainty by ophthalmoscopic examination. Owing to the lack of development of the macula, there was no fixation spot, and consequently there was a failure of coordination of the muscles of the eye, and the result was a rapid nystagmus in an attempt to visualize the object. Occasionally this affection was associated with oscillatory head movements, the so-called *spasmus nutans*. Dr. Frank stated that the treatment in these cases consisted mainly in correcting any refractive error present; otherwise nothing could be done for these sufferers. Dr. R. Thomas (*The British Medical Journal*, Volume I, 1933, page 823) had recorded two cases of spontaneous cure in children aged five and six years, who had been under observation from birth. Dr. Thomas's treatment consisted in correcting errors of refraction with Crookes Number 2 glasses, which followed the theory that a partial albinism was the cause of the nystagmus. However, this method of cure was most unusual; congenital nystagmus was as a rule permanent.

Parkinsonism.

Another patient shown by Dr. Frank was a male, twenty-one years of age, who was first seen on February 20, 1936, complaining of nervousness for the past two years, which had followed the shock of his father's death. At the onset he had noticed deficiency of speech, and this was followed by tremor of his left hand and both lips, and his tongue had also shown movements at times. There was no history of urinary upset, and there was nothing of note in his past history except for a mild attack of influenza two and a half years previously. On examination the patient had an expressionless face, infrequent blinking movements of the eyes, an open mouth, and an indefinite quiver of both the upper and lower lips. The tongue, at rest, was slightly protruded and showed a rhythmical to-and-fro movement tremor in time with the facial tremor. In addition there was a fine rhythmical tremor involving the flexors and extensors of the forearms, sometimes with the pronation-supination component. The speech suggested a spastic dysarthria; there was a poor reaction of the pupils to light (both direct and consensual) and no reaction on attempted accommodation. The right plantar reflex was extensor, the left reflex flexor; and no sensory loss was detected. Examination of the cerebro-spinal fluid for cells and globulin and by the colloidal gold and Wassermann tests revealed no abnormality. The blood Wassermann test gave no reaction and an ophthalmoscopic examination showed the fundi to be healthy. The patient had probably a bilateral basal ganglia lesion, with possibly some involvement of the pyramidal fibres in the internal capsule, producing the bilateral upper motor neurone lesion of the facial and laryngeal musculature. It did not appear to be typically post-encephalitic, nor did the attack of influenza correspond to an attack of *encephalitis lethargica*. Treatment was carried out with hyoscine or tincture of stramonium, but there had been no response up to the time of the meeting.

Chronic Gastric Ulcer and Toxic Goitre.

Dr. Frank also showed a male patient, thirty-six years of age, who was admitted to the hospital on May 14, 1936. He had stated that two and a half years earlier he had begun to suffer from epigastric pain, not definitely related to meals, but which was relieved by taking alkali. The attack lasted for three weeks and recurred four months later; several similar recurrences of pain at various intervals had been noticed until four months before the

meeting, and since then the epigastric pain had been almost continuous. Two months before the meeting the patient had reported at the out-patient department and a barium meal which was administered at that time revealed a chronic penetrating ulcer on the lesser curvature of the stomach. With special diet and alkali powder the abdominal pain rapidly subsided.

One month later the patient had complained of watery eyes, and examination then showed slight exophthalmos of both eyes, a fine tremor of the hands, clammy skin and a slight, regular thyreoid enlargement. The pulse rate was 120 in the minute. In addition, the patient had lost 12·6 kilograms (two stone) in weight in the past two years, although his appetite had been good; these findings were typical of toxic goitre. A basal metabolic rate estimation made one week before the patient's admission to hospital gave a reading of +52 and confirmed the clinical diagnosis.

Dr. Frank said that this case was shown to illustrate the occurrence of two entirely distinct clinical diseases in the one patient, and also to illustrate the necessity for thorough examination. When the patient was first seen a gastric carcinoma was suspected from the history, the poor general health of the patient and the loss of weight. With reference to treatment, he was having a routine peptic ulcer treatment in addition to pre-operative medication for an operation on his toxic goitre. Six days before the meeting his condition had improved greatly; his peptic ulcer was quiescent, whilst his sleeping pulse rate was then 72 per minute. Dr. Frank thought that in another ten or fourteen days he should be fit for a partial thyreoidectomy. After operation it would be essential for him to keep to a rigid ulcer diet. At the moment there was no indication for surgical treatment for his ulcer.

(To be continued.)

NOMINATIONS AND ELECTIONS.

THE undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Windeyer, Ella Spencer, M.B, B.S, 1936 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

The undermentioned have been elected members of the Victorian Branch of the British Medical Association:

Lawson, Donald Forsyth, M.B., B.S., D.G.O., 1933 (Univ. Melbourne), Women's Hospital, Carlton, N.3.

Penington, Alan Harry, M.B, B.S., 1933 (Univ. Melbourne), Austin Hospital, Heidelberg.

Townsend, Sydney Lance, M.B., B.S., 1936 (Univ. Melbourne), Anderson Street, Bendigo.

Webb, Richard Ramsay, M.B., B.S., 1933 (Univ. Melbourne), Mental Hospital, Ararat.

Correspondence.

THE PRINCE HENRY HOSPITAL, SYDNEY.

SIR: The imminent transfer of the control of the Prince Henry Hospital (late the Coast) from the New South Wales Government to a hospital board is an important event in the medical history of the State. Assuming that the proposed scheme becomes law, there are likely to be several administrative changes. These are of extreme interest to medical men and the laity, as well as politicians.

It is the cause of resident medical officers with which I am concerned in this letter. At present the resident medical officers at this hospital receive splendid treatment as regards responsibility, surgery, accommodation, remuneration and recreation leave. In every one of those five respects the Prince Henry Hospital stands preeminent above its local contemporaries, who should aim to emulate successfully those parts of the administration and to elevate and emancipate the junior resident medical officer from his unnecessarily humble position.

Thus it will be a retrogressive step should the Prince Henry Hospital fall into line with other metropolitan hospitals and their petty policy of parsimony.

The proposed new board of management, with its complement of representatives of medicine, will be charged with the important responsibility of maintaining the present exemplary high standard. Let the board rise from the ashes like the phœnix, with renewed vigour; let it stand firm in the continuance of a progressive policy which constitutes a challenge to kindred institutions, invites emulation by them, and prompts me to express my appreciation of a generous deal for the recent graduate.

Yours, etc.,

ISADORE IRVINE BRODSKY.

Sydney,
June 22, 1936.

THE HISTIDINE TREATMENT OF PEPTIC ULCER.

SIR: There has been much recent correspondence regarding the use of the amino-acid histidine in the treatment of chronic peptic ulcer, and it would appear that some practitioners believe this substance will prove to be the magic wand to end all suffering from these diseases. Such a hope would not appear to be based on logical reasoning.

This treatment is the application of certain experiments on dogs performed by Aron, of Strasburg, in 1933. He produced artificial ulcers and showed that those animals which received injections of histidine lived and became free from ulceration while the untreated ones died. The assumption was that the ulcers were perpetuated by a deficiency in the amino-acid histidine.

Seeing that this treatment is therefore purely replacement therapy, its application in human beings could be saved from empiricism were it possible to show that histidine deficiency is present in peptic ulcer patients. Unfortunately, there is every reason to believe that such a common amino-acid is amply supplied in all but the most freakish diets.

Surely in patients with peptic ulceration, especially of the duodenal ulcer type, our therapy should be directed towards the underlying factors, the hypertonic, rapidly emptying stomach, the free acidity and the nervous strain.

It is possible that by replacement therapy histidine injections may give temporary relief of symptoms, but, on the other hand, the good results which have been claimed for such treatments are not surprising, since ulcer symptoms usually occur in cycles characterized by periods of exacerbation followed by longer periods of remission. During the former period injections of sterile water might also be accredited with curative effects if judged by the subsequent and usual period of quiescence with relief from symptoms.

There have been many other forms of injection therapy, but none has withstood the test of time. With regard to histidine treatment, we surely have not yet sufficient evidence to show that ulcers are caused by this amino-acid deficiency, and even if such were the case is it not unreasonable to expect that a short course of injections would completely rid the patient of a disease characterized by its extreme chronicity?

Yours, etc.,

L. J. JARVIS NYE.

Wickham Terrace,
Brisbane,
June 22, 1936.

Books Received.

ALLERGY OF THE NOSE AND PARANASAL SINUSES, by F. K. Hansel, M.D., M.S.; 1936. St. Louis: The C. V. Mosby Company; Melbourne: W. Ramsay (Surgical) Proprietary Limited. Super royal 8vo, pp. 820, with illustrations. Price: 63s. net.

AN INTRODUCTION TO HYGIENE, by W. Robertson, M.D., D.P.H., F.R.C.P.E.; Second Edition; 1936. Edinburgh: E. and S. Livingstone. Crown 8vo, pp. 329, with illustrations. Price: 8s. 6d. net.

ADVENTURES BEFORE BIRTH, by J. Rostand, translated by J. Needham; 1936. London: Victor Gollancz Limited. Crown 8vo, pp. 157, with illustrations. Price: 4s. 6d. net.

FAMILY MEDICAL INSURANCE: A NEW SCHEME WITH EVIDENCE, collated by J. Lachlan-Cope; 1936. London: John Bale, Sons and Danielsson, Limited. Crown 8vo, pp. 64. Price: 2s. net.

Diary for the Month.

JULY 14.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
JULY 14.—Tasmanian Branch, B.M.A.: Branch.
JULY 15.—Western Australian Branch, B.M.A.: Branch.
JULY 21.—New South Wales Branch, B.M.A.: Ethics Committee.
JULY 21.—Tasmanian Branch, B.M.A.: Council.
JULY 22.—Victorian Branch, B.M.A.: Council.
JULY 23.—New South Wales Branch, B.M.A.: Clinical meeting.
JULY 24.—Queensland Branch, B.M.A.: Council.
JULY 28.—New South Wales Branch, B.M.A.: Medical Politics Committee.
JULY 30.—New South Wales Branch, B.M.A.: Branch.
JULY 30.—South Australian Branch, B.M.A.: Branch.

Medical Appointments.

Dr. L. W. Jeffries, Dr. S. R. Burston and Dr. K. McEwin have been appointed members of the Nurses' Board of South Australia, under the provisions of the *Nurses' Registration Act*, 1920.

* * *

Dr. W. E. Jones has been appointed Director of Mental Hygiene, Victoria, for a period of six months, pursuant to the provisions of Section 5 of the *Lunacy Act*, 1928.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser", pages xviii, xix, xx.

AUSTIN HOSPITAL FOR CANCER AND CHRONIC DISEASES, HEIDELBERG, VICTORIA: Honorary Ophthalmologist.
DEPARTMENT OF HEALTH, CANBERRA, FEDERAL CAPITAL TERRITORY: Medical Officer.
FREMANTLE HOSPITAL, FREMANTLE, WESTERN AUSTRALIA: Junior Resident Medical Officer.
METROPOLITAN INFECTIOUS DISEASES HOSPITAL BOARD, ADELAIDE, SOUTH AUSTRALIA: Junior Resident Medical Officers.
REPATRIATION COMMISSION, BRISBANE, QUEENSLAND: Resident Medical Officer.
SOFALA HOSPITAL, SOFALA, NEW SOUTH WALES: Medical Officer.
THE EASTERN SUBURBS HOSPITAL, SYDNEY, NEW SOUTH WALES: Resident Medical Officer.
THE HORNSBY AND DISTRICT HOSPITAL, HORNSBY, NEW SOUTH WALES: Honorary Officers.
YALLOURN MEDICAL AND HOSPITAL SOCIETY, YALLOURN, VICTORIA: Medical Officer.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCHES.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Brisbane Associate Friendly Societies' Medical Institute. Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY Hospital are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Lodge appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 205, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (Wellington Division): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Editorial Notices.

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